

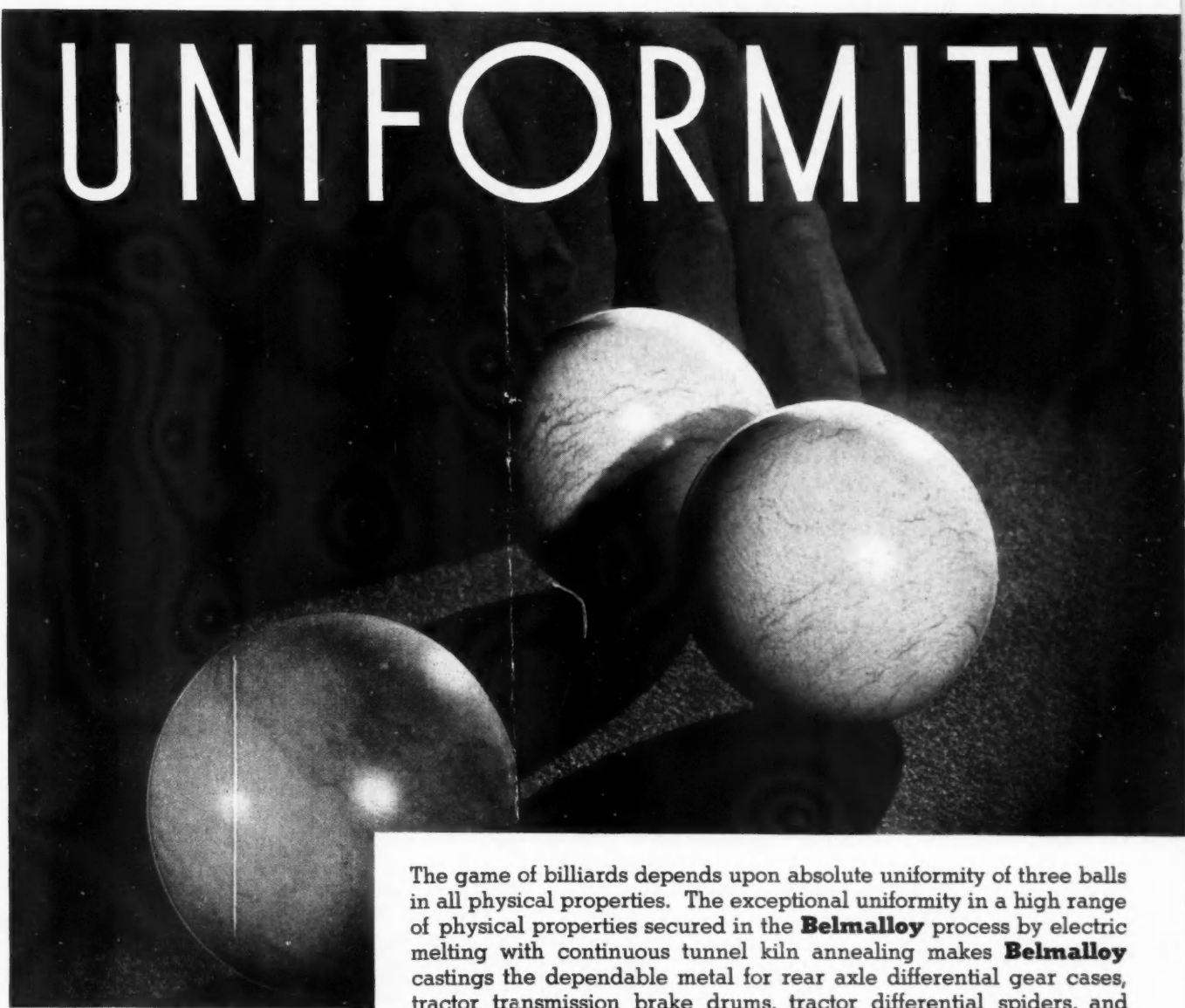
# AUTOMOTIVE INDUSTRIES

DEC 10 1938

LAND — AIR — WATER

DECEMBER 17, 1938

## UNIFORMITY



The game of billiards depends upon absolute uniformity of three balls in all physical properties. The exceptional uniformity in a high range of physical properties secured in the **Belmalloy** process by electric melting with continuous tunnel kiln annealing makes **Belmalloy** castings the dependable metal for rear axle differential gear cases, tractor transmission brake drums, tractor differential spiders, and a variety of similar parts where endurance and maintenance of size under heavy load are a requisite. **Belmalloy** combines Rigidity, Shock Resistance, Hardness, Machinability 25-40% easier than steel, with Reasonable Cost, between steel and malleable.



**Belmalloy**

**BELLE CITY MALLEABLE IRON CO.**  
RACINE, WISCONSIN

T. S. 70000-80000. Y. P. 45000-55000. Elong. 6-12%. BHN 179-207. Mod. 28-34,000,000.

# ***NO MESSY MIXING JOB***

## ***WITH***

# ***PREMIER CUTTING OIL***

● A WESTERN machine tool manufacturer was dissatisfied with the finish on parts cut from high alloy steels. After numerous trials he was using a mixture of base oils and paraffin oil, but this resulted in a troublesome mixing problem and increased oil costs.

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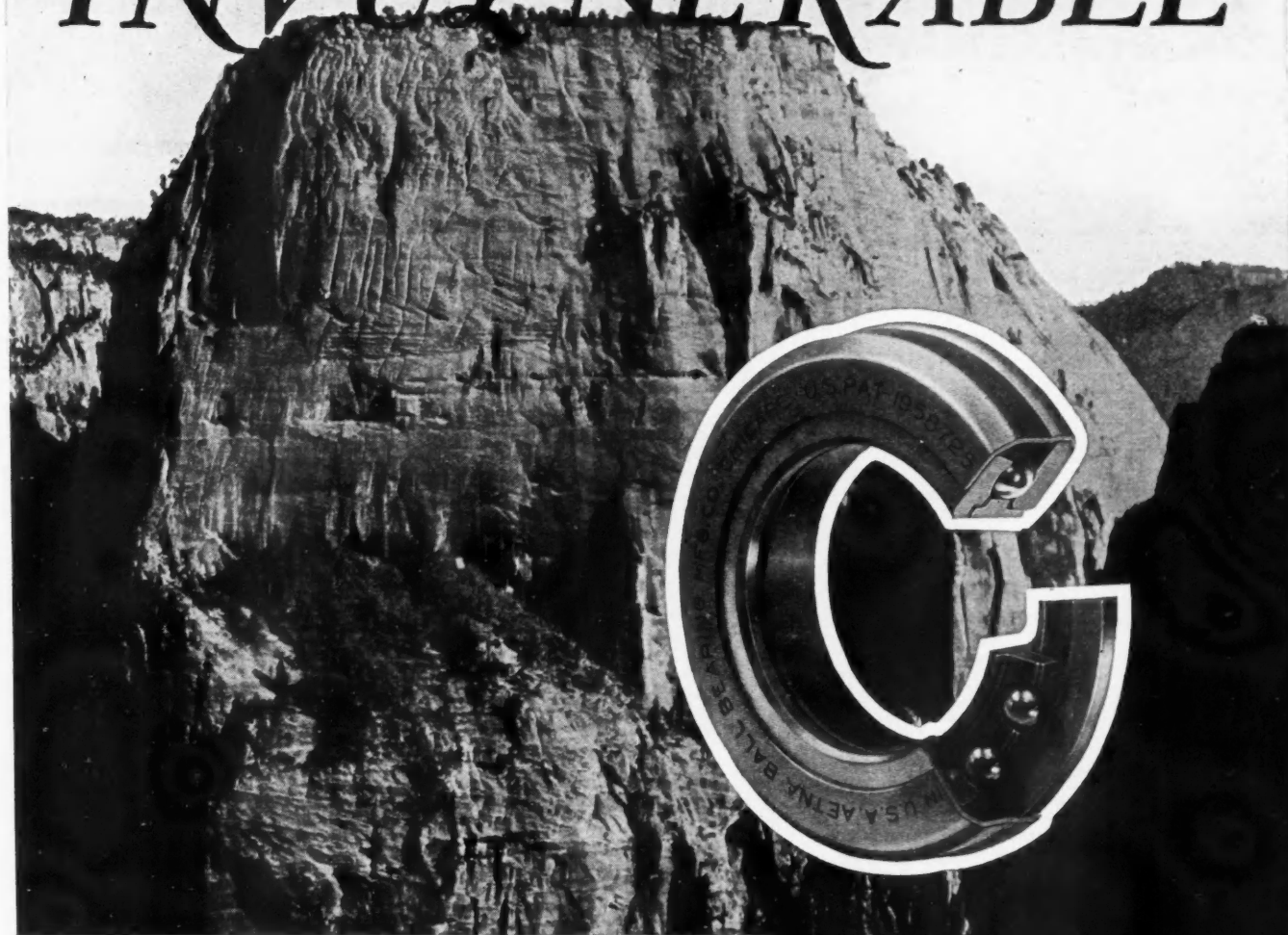
A Lubrication Engineer will be glad to recommend the cutting oil in Standard's line that exactly meets your need. Ask to have this Engineer call on you soon. Write Standard Oil (Indiana) 910 South Michigan Avenue, Chicago, Ill.

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**STANDARD OIL COMPANY (INDIANA)**  
**LUBRICATION ENGINEERING** THE RIGHT LUBRICANT • PROPERLY APPLIED  
TO REDUCE COSTS



# INVULNERABLE



● Just as you take for granted the mountain's ability to withstand the elements so too can you rely on Aetna "T" Type Clutch Release Bearings to conquer the toughest assignments encountered in modern motordom. In torture test machines generating heat up to 270° F., speeds up to 3600 R.P.M., in bus and taxi fleets, light and heavy duty trucks imposing every extreme of use and abuse Aetna "T" Type Clutch Release Bearings have unfailingly proven themselves stamina champions. Add this inherent quality (assured in each bearing by 44 inspection tests) to Aetna's patented design that guarantees life-time lubricant retention and abolishes the noise, wear and tear of eccentric thrust and you have the answer to every clutch release bearing problem and the reason why you should consider them for your own cars and trucks. AETNA BALL BEARING MANUFACTURING COMPANY, 4608 SCHUBERT AVE., CHICAGO, ILL. Detroit Office: 7310 Woodward Ave. Cleveland Office: 402 Swetland Bldg.

## Aetna *T* Type

CLUTCH RELEASE BEARINGS

— THE "T" TAMES TROUBLE —

Advertisement

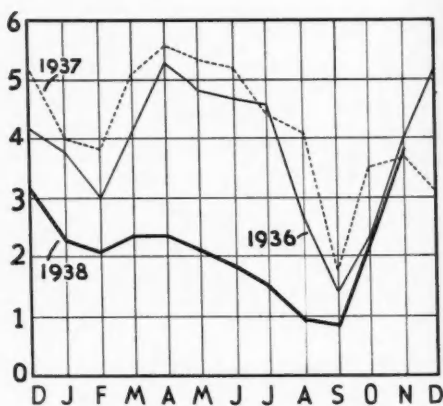
# AUTOMOTIVE PRODUCTION\*

Passenger Cars and Trucks  
—U.S. and Canada

Bar charts at the right represent total production to Nov. 30th of year indicated.

Numbers at left of monthly graph below show production in 100,000's.

\*From Department of Commerce Report and Automobile Manufacturers' Ass'n.



FULL YEAR — 4,616,437  
1936 TO NOV 30<sup>TH</sup> 4,097,316  
FULL YEAR — 5,016,565  
1937 TO NOV 30<sup>TH</sup> 4,669,088

1938 TO NOV 30<sup>TH</sup> 2,241,331

## Ideas in Zinc

1939 finds automotive engineers changing the mechanical details of doors to complete the picture of safety, comfort, and efficiency. The safety rotary door latch, made by the Hancock Manufacturing Company, is creating widespread interest in automotive circles. And the use of a zinc alloy die cast rotor in the new latch will be of particular interest to those automotive folk whose job it is to specify materials.

Adopted by Studebaker, Chrysler, Dodge and De Soto, this latch embodies an entirely new principle of operation. The secret of the rotary latch action comes from the fact that the total force involved in locking and holding the mechanism is broken into three distinct cam motions, each with its own small spring. While the action is continuous from cam to cam, the actual force required to close the door against the latch is just a fraction of what has been considered necessary.

Naturally, great care was exercised in the selection of material for the rotor used in the latch assembly. This part is subject to considerable abuse and must be expected to give efficient service over a comparatively long period. The fact that the part is a zinc alloy die casting is food for thought for materials engineers.

Here is a pointed demonstration of the utility of zinc alloy die castings for purely mechanical applications—where physical strength and resistance to wear are combined with low production costs. This avenue of production has been opened to automotive engineers through the availability of the high strength, stable Zamak alloys, based on Horse Head Special ZINC of 99.99+ % purity. The New Jersey Zinc Company, 160 Front Street, New York City.

Idea No. 20

Automotive Industries

When writing to advertisers please mention Automotive Industries

December 17, 1938

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# AUTOMOTIVE INDUSTRIES

## AUTOMOBILE

Reg. U. S. Pat. Off.  
Published Weekly

Volume 79

Number 25

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Advertising News Notes	Chart of Production Activity
Business in Brief	Tools of Tomorrow
Automotive Metal Markets	Calendar of Coming Events
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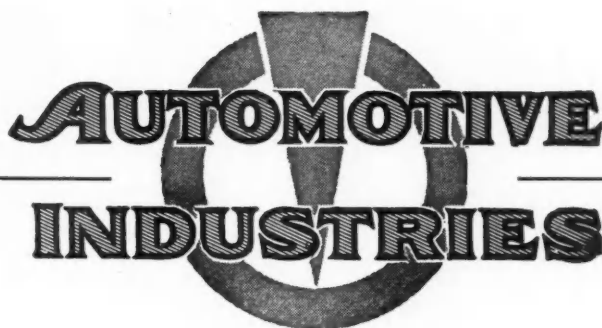
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## AUTOMOTIVE INDUSTRIES

### Summary of Automotive Production Activity (Week Ending Dec. 17)

**BUSES** As one producer expressed the production situation "Things are seeing back and forth with very little change one way or the other from an average of slightly less than 50 per cent capacity operation." Optimism for future improvement persists as more inquiries about new equipment are reported.

**TRUCKS** Several companies have had an unexpected increase in orders, which in some instances is believed to be a result of the truck show. Most producers anticipating a good season in 1939.

**TRACTORS** Companies claim that indications from dealers point to 1939 as a year at least as good and possibly better than 1938. Two of the principal builders expect to step-up production immediately after Jan. 1.

**AUTOMOBILES** Barely missing the 100,000 mark for the week ended Dec. 17, the industry will probably achieve an output slightly in excess of 400,000 units for the month. Some slight modification of schedules during January and February is anticipated because of normal seasonal factors.

**MARINE ENGINES** Prospects are for an early upturn next year. Small Diesel units are expected to boom.

**AIRCRAFT ENGINES** Production close to peak. Research and experimental work is moving at top speed.

*This summary is based on confidential information of current actual production rates from leading producers in each field covered. Staff members in Detroit, Chicago, New York and Philadelphia collect the basic information, in all cases from official factory sources.*

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## Production

### Week's Output of Almost 100,000 Points to 400,000 for December

Car and truck production during the week ending Dec. 17 was expected to be only a few thousand units lower than the previous week in spite of the elimination of one day's production by a major manufacturer to satisfy union demands for a 32- rather than a 40-hour week, a mid-week survey of factory schedules indicated.

Gains registered by four independents—Nash, Studebaker, Willys and Hudson—were not sufficient to offset an anticipated drop at Chevrolet which this week went on a four-day schedule from its previous five-day week. As a result it was anticipated that the industry's total output of new cars and trucks for the week would fall just barely short of the 100,000 mark, a mark which it had been able to exceed by a slight margin during the previous two weeks.

It is estimated that December production through the week ending Dec. 17 has totaled between 225,000 and 250,000 units and with two full weeks to go in spite of the impending holidays, preliminary estimates of a December total slightly in excess of 400,000 units should stand, as should the preliminary estimates of 1,000,000 cars and trucks during the last quarter of 1938.

General Motors divisions continued to lead the production parade during the current week with an estimated total output of approximately 39,300 cars and trucks. Ford, including Mercury, Lincoln-Zephyr and Lincoln, continued to run on a par with Chrysler divisions with each group accounting for an estimated total slightly in excess of 23,000 units.

As already indicated four independents—Nash, Studebaker, Willys and Hudson—expected to show gains in their weekly output with all other producers maintaining the pace in effect since the first of December.—J.A.L.

## News of the Industry

### MACHINE TOOL INDEX DOWN

• The index of machine tool orders prepared by the National Machine Tool Builders' Association stood at 112.2 for November, indicating a recession in total demand for machine tools of about 5 per cent less than October, and about 8 per cent under August, the highest point of the year to date. Domestic business was slightly stronger during November, making the month the best of the year to date for domestic volume. Foreign orders are down proportionately. The three months' average, or trend, is slightly downward.

### FINANCIAL

• The Electric Auto-Lite Co., Toledo, Ohio, has declared a dividend of 50 cents per share payable Dec. 23 to stockholders of record Dec. 20.

• The City Auto Stamping Co., Toledo, Ohio, has declared a dividend of 15 cents per share on 375,000 shares payable Dec. 24 to stockholders of record Dec. 19.

• The total number of General Motors common and preferred stockholders for the fourth quarter of 1938 was 389,509 compared with 399,255 for the third quarter of 1938 and with 375,755 for the fourth quarter of 1937.

There were 368,265 holders of common

stock and the balance of 21,244 represents holders of preferred stock. These figures compare with 378,150 common stockholders and 21,105 preferred for the third quarter of 1938.

### GM OVERSEAS SALES

• Sales of General Motors cars and trucks to dealers in the overseas markets during November totaled 26,050 units, representing a decline of 11.2 per cent from sales in November of last year.

In the first 11 months of 1938, sales of 326,664 units represented a decline of 2.3 per cent from sales in the first eleven months of 1937.

For the 12 months through November, 1938, sales totaled 355,734 units—a decrease of 2.4 per cent from the volume in the 12 months ended November 30, 1937.

### TIRE & RIM INSPECTIONS OFF

• The Tire & Rim Association reports that 1,722,769 rims were inspected and approved during November, 1938, a decrease of roughly five per cent from the number inspected and approved in the same month last year. Rims inspected and approved for the first 11 months of 1938 aggregated 8,794,369, a decrease of approximately 58.5 per cent.

## News of the Industry

### NOVEMBER REGISTRATIONS

● Total November registrations of new passenger cars in 10 states of the country are reported by R. L. Polk & Co. at 25,663, an increase of 53.49 per cent over registrations in the same states in October.

Corresponding figures for November, 1937, are reported by Polk at 26,467, the registrations for the past month being only 3.04 per cent below that mark.

Truck sales in the same 10 states in November showed a less abrupt increase over October figures. Registrations totaled 3129, for a 1.69 per cent gain over the 3077 of the preceding month.

November, 1938 registrations are 21.40 per cent under the total of 3981 recorded for the same states in November of last year, however.

### BUICK-CHEVROLET-HUDSON

● Sales of Buick motor cars during November broke all records for this month and established a new high for the year, with domestic retail deliveries totaling 21,576 units.

The November deliveries compared with 19,103 cars sold in October and with 19,344 deliveries in the corresponding month last year.

Sales during the last 10 days of the month showed an increase over previous periods, 7503 cars being delivered, against 7246 in the previous 10 days and 5933 in the corresponding period a year ago.

● Chevrolet dealers sold 76,938 new cars and trucks at retail during the month of November. This is an increase of 4455 units over sales for the same month in 1937.

The last 10 days of the month, Chevrolet's figures indicate, looked particularly good in comparison with the corresponding period last year. Sales in that period were 25,045, as against 20,310 in the final 10 days of November, 1937.

● Shipments of Hudson cars in the United States for the week of Dec. 3 were 57 per cent higher than for the same period a year ago. The company reports that retail sales for this week were greater than for any previous week in the last 12 months and 10 per cent above the same week last year.

### AIRCRAFT—U. S. & CANADA

● Whether domestic aircraft manufacturers are lagging behind foreign builders in construction and design is a question on which government officials do not agree.

President Roosevelt expressed doubt at a press conference last week that foreign manufacturers have the edge while earlier in the week Assistant Secretary of War Louis Johnson took the opposite view.

In his annual report to the Secretary of War, Mr. Johnson recalled that a year ago he wrote that combat airplanes under construction were in general "the best and most efficient in the world."

"Now, however, our former technical superiority in aeronautical development is no longer clearly apparent," the Assistant Secretary reported last week. "Recent advances in other countries have equaled if not exceeded our efforts. We have known for some time that foreign nations far surpassed us in the number of military aircraft at their disposal but we also knew

that we led the field technically. It now appears that our research and development programs must be accelerated if we are to regain our position of technical leadership."

● Reorganization plan of Stearman-Hammond Aircraft Co. was filed this week in bankruptcy court in San Francisco, Calif. The plan provides for issuance of new common stock in the same amount as the old, 286,000 shares of 62½ cents par value, to present holders, and satisfaction of unsecured creditors for each \$2.50 of claims.

● Boeing Aircraft Co. has announced that the 74 passenger, four-engined clipper built for Pan American Airways' trans-oceanic service will soon be flown from Seattle to San Francisco for delivery to Pan American.

● Ryan Aeronautical Co. has advised stockholders of its intention to offer them 75,000 shares of its capital stock in the ratio of one share for each four shares held at a price to be determined later. Sale of the additional 75,000 shares will bring outstanding stock to 375,000 shares. It is also proposed to increase authorized capital stock to 500,000 shares of \$1 par value from 300,000 shares as at present.

● The War Department has awarded a \$2,346,128 contract to North American Aviation, Inc., of Inglewood, Calif., for 14 observation planes and spare parts.

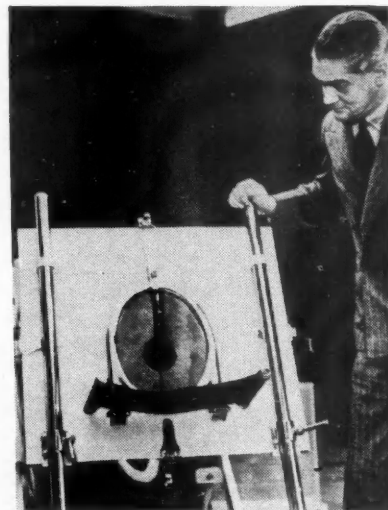
The planes, all of the O-47B type monoplane powered with a Wright cyclone engine developing about 550 hp., will be assigned to the aviation arm of the National Guard with the exception of 24 to be assigned to the regular army.

● Canadian Car & Foundry Co., Ltd., Montreal, has received a contract from the British Air Ministry for building first-line airplanes, according to an announcement by Victor M. Drury, president of the company.

● Industries in Canada produced 110 airplanes valued at \$1,461,626 in 1937, compared with 109 worth \$1,210,910 in the previous year. Exports of made-in-Canada airplanes and parts in 1937 amounted to \$264,687, a drop of \$95,386 compared with \$360,073 in 1936. Exports of aircraft made with imported parts amounted to \$27,230 against \$45,972 in 1936. Imports of aircraft and complete parts, not including engines, rose to \$1,388,621 in 1937 from \$944,723 in 1936. Engines and complete parts imported were valued at \$1,032,664 in 1937, and \$339,444 in the previous year.

### TO INCREASE GASOLINE YIELD

● The discovery of a process increasing the gasoline yield from crude oil and the prediction that the process would be of "enormous benefits industrially," were announced by the physics department of Toronto University the past week. The process was discovered by Dr. C. E. Barnes, assistant in the department, working in conjunction with engineers from the British-American Oil Co. Ltd., Toronto, Ont., and the Baily Meter Co. of Cleveland, Ohio. The discovery, which the announcement said "may prove to be of considerable importance to the oil and chemical industries" applied particularly to processes used in increasing the gasoline yield from residues in crude oil which in themselves were too heavy to be used directly as motor fuel.



International  
**IRON LUNGS**, 5000 of them, will be given to English hospitals and health institutions by Lord Nuffield, wealthy British manufacturer of automobiles and airplanes. Lord Nuffield, shown above with the first of the "Iron Lungs" to be turned out at his plant at Cowley, England, is supplying these invaluable machines at a cost to himself of about \$2,500,000.

## Abstracts

### Aluminum and Magnesium in Aircraft Construction

In a paper read before the Royal Aeronautical Society in London recently, R. Le Coeuvre said that carburetor bodies are now being made of magnesium and certain aluminum alloys by the pressure die-casting process. An experimental investigation of the effects of compression during solidification of castings was made at the Institute of Foundry Research at the École Supérieure de Fonderie in Paris. Some large castings were subjected to pressure in an autoclave, and it was found that the grain was refined and the mechanical properties of the casting were improved.

The recent development of aluminum-magnesium alloys opened new possibilities for aircraft designers. These alloys possess two important properties in that they can be welded and that they are immune to corrosion by sea water. These properties are believed to be due to the great homogeneity of their structure and the entire absence of copper in their composition. Annealed alloys containing less than 7 per cent of magnesium have a tensile strength of 45,000-52,000 lb. per sq. in. and a good elongation. The alloys can be worked cold and can be deep-drawn without injury. They can also be worked hot. Alloys with from 7 to



9 per cent magnesium have a tensile strength of 60,000 lb. per sq. in., with good elongation. These properties are obtained by heat treatment. The alloy is quenched from a temperature of about 840 deg. Fahr., but between 300 and 650 deg. Fahr. it passes through a brittle range, and it is not advisable to allow it to remain long within this range. The aluminum-magnesium alloys can be greatly improved by small additions of other metals, notably titanium, but these improved alloys have not yet passed the development stage.

#### Sulzer Two-Stroke, Two-Piston Diesel Engines

The Swiss firm of Sulzer Brothers in Winterthur, which has long been known as a leading producer of large Diesel engines for stationary and marine purposes, recently brought out a new line differing radically from its former designs. As shown by the sectional drawing reproduced herewith, the engine has two pistons in each cylinder which connect through links and walking beams to a single crankshaft below the horizontal cylinder or cylinders. A single cylinder size of 90 by 2 x 120 mm. (3.53 by 2 x 4.73 in.) is being used, and one-, two-, three-, and four-cylinder models are already in production, while five- and six-cylinder models are still under development. The displacement is 93 cu. in. per cylinder, and the output 30 hp. per cylinder at 1500 r.p.m.

The engines are intended for stationary and marine purposes. Cylinder liners are renewable. Needle

(Turn to page 784, please)

## U. S. Production Plan Is Obsolete

*Says GM's Sloan in Testifying Before Senate Sub-Committee; Urges "A Reduction of the General Taxes on Business"*

Alfred P. Sloan, president of the General Motors Corp., told a Senate Finance sub-committee last week that the best plan for applying a tax incentive principle to business would be to stimulate the substitution of new machinery for old, thereby creating employment in the capital goods industries which, he said, is vital in any continuing prosperity.

"This country's production plan is obsolete, as measured by today's technology," Mr. Sloan testified. "The true way to enlarge present pay envelopes and provide more envelopes for more workers is to do these things that mean lower prices. This can only be accomplished by increased productivity. Today, the tax structure as constituted, and its administration, tend to discourage the substitution of the new for the old. Anything that can be done in the way of tax incentive—and I think more can be done in the general direction that I am urging—will, in my judgment, be a real step toward the objective which the committee has in mind."

The sub-committee, composed of Senator Vandenberg, Republican, of Michigan, and Senator Herring, Democrat, of Iowa, has been taking testimony for the past two weeks based on the possibility that business may be encouraged to adopt policies beneficial to labor and to industry itself if the Government would make some tax concessions.

Featured in the proceedings has been the so-called profit-sharing system, under which industry presumably would turn over some part of its profits to workers, in return for which the Government would make a reduction in the taxes they pay.

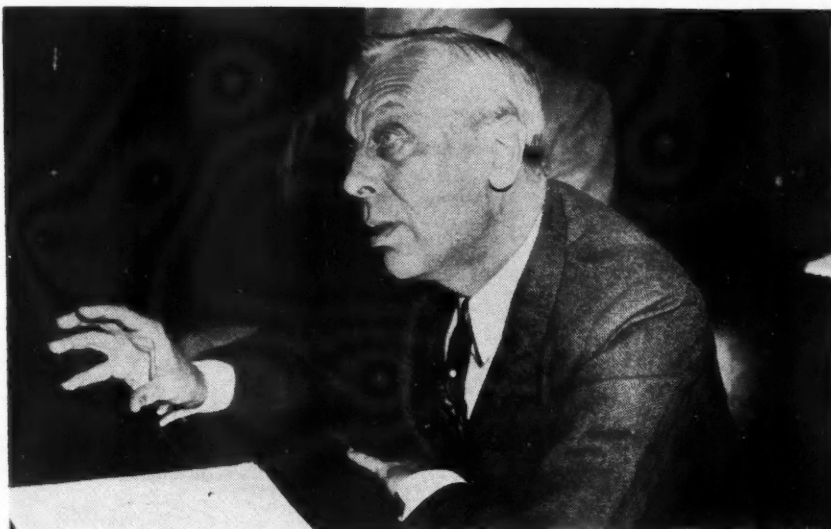
Mr. Sloan took the position that "true profit-sharing" is not applicable as a general thing because "outside of a limited number of special cases that always arise, there are not sufficient profits to apply an equitable formula and mean anything consequential to the workers except, perhaps, in limited periods of prosperity."

And even then, he continued, it can be done in relatively few instances, unless so much of what there is of profits is diverted as to prejudice the profit motive. In illustration, he cited the return on capital employed by 16 leading industrial organizations in their respective fields with capital of \$100,000,000 or more apiece, pointing out that it has only been 8 per cent over the past 15 years. "In all manufacturing companies the average return is less than 5 per cent per year over this period. In addition to this profit limitation, I believe there are other real practical objections to true profit sharing; therefore, its use should be determined by the judgment of individual management without the application of the tax incentive principle."

Mr. Sloan, who referred only once to the loan system recently announced by his company, which he described as a method designed to assure the workers a continuity of income, expressed the view that the committee has two objectives underlying its work: (1) What can be done to promote the interests of the workers of industry; and (2) what can be done to promote greater productivity of industry—more and better jobs, in other words, with greater security.

"I believe that what industry can afford to pay to the worker in addition to the highest economic wage can best be used for promoting stability of work, stability of income, or both," he continued. "We need to supplement the worker's income in poor years, rather than try to increase it in the good years. A little something extra in good times serves to establish a standard of living

(Turn to page 780, please)



#### "THE ONLY WAY

you can raise wages is by increasing productivity per man," Alfred P. Sloan, chairman, General Motors Corp., tells Senate Finance Sub-Committee. Mr. Sloan, pictured here presenting his

views during hearings held in Washington last week, told the committee that the best plan for applying a tax incentive principle to business would be to stimulate substitution of new machinery for old. (See story on this page.)

International

## News of the Industry

### 40 Years Ago

In its last issue an organ of the carriage trade advises its constituents to co-operate with horse shows and horse-loving people and thus further their interests. A grand national association of horse shows and horse propaganda is suggested, and we are informed that in certain society circles there is a reaction in favor of the horse. Many fashionable ladies, we are assured, who have graduated from the bicycle, have turned to horseback and carriage riding for what our exchange is pleased to call "a higher gratification."

From *The Horseless Age*, December, 1898.

### PUBLICATIONS AVAILABLE

Walker-Turner Co., Inc., Plainfield, N. J., has brought out a new catalog covering its line of **power tools**.\*

A new 150-page handbook on **contour sawing** has been issued by Continental Machine Specialties, Inc., Minneapolis, Minn. Continental has enlarged and revised its handbook, including material from the case record book "Twenty-five Ways to Cut Machining Costs" as well as complete engineering data on Doall contour sawing technique.\*

Continental Machine Specialties, Inc., Minneapolis, Minn., has published a folder in which the company's **band filer** is described.\*

The Flexible Metal Hose & Tubing Institute has announced publication of a booklet entitled "**The Fact Book of Flexible Metal Hose and Tubing**."\*

\* Obtainable from editorial department, AUTOMOTIVE INDUSTRIES, Address Chestnut and 56th Sts., Philadelphia.

### FORD—NLRB

● Alfred McCormack, New York attorney for the Ford Motor Co., asked the Supreme Court on Wednesday to deny the Labor Board's petition to reopen its case against the company's Michigan plants under which the firm would be required to re-instate 29 employees.

In arguing the case, Mr. McCormack insisted that the circuit court had sole jurisdiction. Specifically, he appealed from a decision by the Federal Circuit Court at Covington, Ky., which had allowed the board to recall the order. The NLRB petitioned for a withdrawal of its order after the Supreme Court on April 25 had condemned procedure of government quasi-judicial agencies in the so-called Kansas City stock yard case.

### ANOTHER CIO DRIVE

● The CIO's Federation of Architects, Engineers, Chemists and Technicians announced early this week that they plan to conduct an organization drive in the automobile and electrical industries.

Meeting at the union's fourth annual convention, the delegates passed a resolution authorizing the organizing campaigns and heard Ed Hall, UAW executive board member, pledge his group's support in efforts to organize technical workers in the automobile industry.

### PRIZE TO THOMPSON PRODUCTS

● The exhibit of Thompson Products, Inc., Cleveland, was awarded first prize for merchandising merit by jobbers who attended the Automotive Service Industries Show at Navy Pier, Chicago, Dec. 5 to 19. Kester Solder Co., Chicago, and the Per-

fect Circle Co., Hagerstown, Md., won second and third prizes. Four hundred manufactures competed for the awards.

### MOTOR BOAT EXPORTS UP

● American motor boat exports during October topped those of the same period last year by 100 units. During this month a total of 670 units were shipped for foreign consumption, as compared to 570 for October, 1937.

## Teetor Testifies

### Perfect Circle Head Gives Views on Profit Sharing to Senate Committee

Lothair Teetor, president of the Perfect Circle Co., Hagerstown, Ind., told a Senate Finance Sub-committee this week that his company had operated profit sharing plans in plants in Newcastle, Hagerstown and Tipton, Ind., but discontinued the policy after the CIO union had made demands for wage increases comparable to the profit sharing dividends. He at-

## Census of U. S.

Motor vehicle engines produced outside of automobile and motor truck plants in 1937, according to the Bureau of the Census, numbered 105,134, with 4,329,906 hp., and were valued at \$11,277,197, compared with a 1935 output of 69,468 engines with 2,719,360 hp. and a value of \$6,582,540.

Automobile engines, including those for taxicabs and light trucks and buses to the number of 92,651, with 3,206,212 hp.

	1937	1935	1933
Internal-combustion engines, total value .....	\$131,246,901	\$85,428,719	\$29,623,768
Injection type—Diesel (compression-ignition) and semi-Diesel (surface-ignition), total:			
Reported by number and by horsepower:			
Number .....	20,351	6,703	1,144
Horsepower .....	1,696,621	920,261	139,331
Value .....	\$41,703,529	\$16,812,239	\$4,662,062
Not reported by number or by horsepower, value .....	\$832,884	\$191,948	\$491,672
Compression-ignition (Diesel):			
Marine: <sup>2</sup>			
For direct connection to propeller shaft:			
Number .....	700	868	147
Horsepower .....	129,789	85,036	27,515
Value .....	\$5,543,248	\$3,277,338	\$1,225,327
For electric drive and auxiliary use:			
Number .....	214	255	61
Horsepower .....	50,436	31,163	13,580
Value .....	\$3,314,522	\$1,859,245	\$602,437
For connection to propeller shaft by reduction gearing:			
Number .....	711		
Horsepower .....	75,378	( <sup>5</sup> )	( <sup>5</sup> )
Value .....	\$3,290,260		
Other Diesel:			
Reported by number and by horsepower:			
Number .....	10,012	3,731	628
Horsepower .....	1,065,853	686,193	81,633
Value .....	\$25,341,953	\$10,333,865	\$2,514,345
Not reported by number or by horsepower, value .....			\$77,328
Stationary:			
Reported by number and by horsepower:			
Number .....	5,942	2,476	567
Horsepower .....	592,505	509,489	66,505
Value .....	\$17,300,783	\$7,282,913	\$2,227,637
Not reported by number or by horsepower, value .....			\$77,328
Other (tractor, bus, heavy truck, aircraft, railway Diesel electric):			
Number .....	4,070	1,253	61
Horsepower .....	473,348	176,704	15,128
Value .....	\$8,041,170	\$3,050,952	\$286,708
Surface-ignition (hot-spot, hot bulb, etc.), all types: <sup>4</sup>			
Number .....	8,462	1,849	308
Horsepower .....	366,535	117,869	16,603
Value .....	\$4,083,428	\$1,341,791	\$319,953
Injection engines with spark ignition:			
Number .....	252		
Horsepower .....	8,630	( <sup>5</sup> )	( <sup>5</sup> )
Value .....	\$130,118		
Injection engines not reported in detail, value .....	\$832,884	\$191,948	\$414,344
Carburetor engines, total value .....	\$83,886,317	\$47,519,810	\$24,470,034
Aircraft:			
Reported by number and by horsepower:			
Number .....	6,214	2,866	1,922
Horsepower .....	2,599,385	1,269,751	926,625
Value .....	\$28,576,971	\$12,610,285	\$8,651,247
Not reported by number or by horsepower, value .....			\$67,875

<sup>2</sup> Not including engines made for installation in ships and boats built or motor vehicles manufactured by the same establishments. <sup>5</sup> Not called for separately.

<sup>4</sup> Separate data were collected for portable and stationary industrial engines and for other types of surface-ignition engines, but it was necessary to combine them to avoid disclosing approximations of the production reported by individual establishments.



tributed the failure of the plan to "hatred" caused by industrial conflict and the failure of workers to recognize the fairness of the profit sharing system to both themselves and their employer.

Urging that business be permitted to develop profit sharing systems without government regulation, Mr. Teetor said:

"The plan has no place on the statute books in this country. To treat the problem as a legislative matter would be to bring fresh turmoil to business."

## The Industry and Agriculture

### Importance of Maintenance and Expansion of Foreign Markets for Farm Products Emphasized by Edgar W. Smith of GM Overseas

Industry and agriculture are economically dependent on each other, not only in domestic but in foreign trade, Edgar W. Smith, vice-president, General Motors Overseas Corp., declared Dec. 15 before the twentieth annual convention of the American Farm Bureau Federation

in the Roosevelt Hotel, New Orleans, La.

Paradoxical as it may seem, Mr. Smith stated, the automobile industry is even more keenly interested in the maintenance and expansion of foreign markets for agricultural products than for products of the motor car industry because the number of motor vehicles sold in the agricultural areas of the United States is far greater than the number sold in all of the United States export markets combined.

"Our car and truck exports during the past 10 years have accounted for an average of 10 per cent of our total production—a margin which more than once, to the individual manufacturer, has meant the difference between profit and loss," he stated in part. "These exports have created employment, in equal proportion, in the automobile and accessory factories themselves and in the basic industries—the mines and the forests and the farms.

"The automobile industry is deeply concerned, certainly, in maintaining and expanding the market it has found for its product abroad. I can say to you quite sincerely, however, that we are even more keenly interested, and more deeply concerned, in seeing the market maintained and expanded in foreign lands for the agricultural commodities that you farmers produce.

"If this statement sounds paradoxical, I have only to remind you that the number of motor vehicles sold in the agricultural areas of the United States is far greater than the number of vehicles sold in all of our export markets combined. We have no illusions, in the last analysis, as to where our greater interest lies. We want to see farm exports increased because we know that our domestic market for motor cars is definitely in jeopardy so long as a lack of foreign demand for American farm products keeps the American farmer from a full measure of prosperity.

"The farmer should recognize for his part, I think, the contribution that an export market for industrial goods can make to his own agricultural welfare. Many products of the farm enter into automobile production, and every vehicle sold abroad increases the consumption

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## Engine Production<sup>2</sup>

and a value of \$6,946,794 were produced last year. Heavy truck and bus engine production in 1937 totaled 12,483 units, with 1,123,694 hp. valued at \$4,330,403. Production of aircraft engines in 1937 totaled 6214 units, with 2,599,385 hp., valued at \$28,576,971.

Statistics for 1937, with comparative figures for 1935 and 1933 are given in the accompanying table.

	1937	1935	1933
<b>Marine:<sup>3</sup></b>			
<b>Inboard:</b>			
Number.....	10,347	5,521	2,602
Horsepower.....	615,475	342,667	131,441
Value.....	\$3,203,663	\$2,237,156	\$948,965
<b>Outboard:</b>			
Reported by number and by horsepower:			
Number.....	77,549	36,711	17,941
Horsepower.....	327,522	151,922	102,756
Value.....	\$4,359,822	\$2,384,967	\$1,249,064
Not reported by number or by horsepower, value.....	\$159,554		
<b>Motor-vehicle, total:<sup>3</sup></b>			
Reported by number and by horsepower:			
Number.....	105,134	69,468	25,302
Horsepower.....	4,329,906	2,719,360	1,324,845
Value.....	\$11,277,197	\$6,582,540	\$3,208,618
Not reported by number or by horsepower, value.....			\$936,750
<b>Automobile (including taxicab) and light truck and bus:</b>			
Reported by number and by horsepower:			
Number.....	92,651		21,923
Horsepower.....	3,206,212		1,056,046
Value.....	\$6,946,794		\$2,272,695
Not reported by number or by horsepower, value.....		(7)	\$936,750
<b>Heavy truck and bus:</b>			
Number.....	12,483		3,379
Horsepower.....	1,123,694		268,799
Value.....	\$4,330,403		\$935,923
<b>Industrial:</b>			
<b>Portable:</b>			
Number.....	52,071	29,530	4,685
Horsepower.....	735,815	807,627	128,685
Value.....	\$5,849,491	\$4,594,367	\$1,013,425
<b>Stationary:</b>			
Number.....	33,166	28,905	6,670
Horsepower.....	800,044	328,221	111,819
Value.....	\$10,352,020	\$6,106,815	\$1,996,902
<b>Tractor engines made for sale separately:</b>			
Number.....	34,149	24,517	6,613
Horsepower.....	1,625,795	989,782	198,528
Value.....	\$5,047,511	\$4,674,524	\$696,357
<b>Railway-car:</b>			
Number.....	2,719		
Horsepower.....	41,191		
Value.....	\$787,198		
<b>Other and not specified types of carburetor engines:</b>			
Reported by number and by horsepower:			
Number.....	254,979	181,060	60,626
Horsepower.....	2,626,072	1,805,891	1,092,626
Value.....	\$13,538,877	\$8,329,156	\$3,857,193
Not reported by number or by horsepower, value.....	\$734,013		\$1,641,638
<b>Mixing valve engines:</b>			
Number.....	20,503	966	
Horsepower.....	116,573	27,101	(8)
Value.....	\$4,624,171	\$904,722	

<sup>2</sup> Withheld to avoid disclosing approximations of data reported by individual manufacturers of automobile engines. See totals for "Motor-vehicle" engines.

<sup>3</sup> Not reported separately, included in "Other and not specified types of carburetor engines," including "Railway car," above.

# News of the Industry

Sloan

(Continued from page 777)

## SAE PLANS FOR DETROIT

• More than 30 technical papers will be presented at the annual meeting of the Society of Automotive Engineers scheduled for Jan. 9-13 in Detroit. The program also includes a day devoted to national defense, a special student session, and the annual dinner which will be held on the evening of Jan. 11.

The tentative list of papers to be delivered at the five-day meeting is as follows: *Aircraft Engine*—BMEP Parameter for Cruising Power Control, by R. E. Johnson and W. G. Lundquist, Wright Aeronautical Corp.; *A Non-Icing, Fully Maneuverable Aircraft Carburetor*, by M. J. Kittler, Holley Carburetor Co.; *Dynamic Suspension, a Method of Air-*

*C. B. Kass and O. G. Lewis, Standard Oil Development Co.; Passenger Car Tires—Pneumatic Tires as They Should Be Engineered for Our Future Cars*, by W. S. James, Studebaker Corp., and P. C. Ackerman, Chrysler Corp.; *Designing the Tire for the Car*, E. A. Roberts, Firestone Tire & Rubber Co.; *Passenger Car Body—The Development of Foamed Latex Cushioning*, by E. E. Ellies, Airfoam division, Goodyear Tire and Rubber Co.; *Trends in Mobile Air Conditioning*, by R. E. Gould, Frigidaire Corp.; *Passenger Car Chassis—Noise and Vibration*, by E. E. Wilson, General Motors Proving Ground; *Diesel Engine—Symposium on Piston Temperatures*, by E. T. Vincent, University of Michigan, will present a digest of a number of contributions on piston temperatures; *Engine Indication with the Cathode Ray Oscillograph*, by J. G. Williams, Superior Engine division, National Supply Co.; *Duration of Combustion in a Commercial Diesel Engine*, by A. F. Robertson, R. A. Rose and G. C. Wilson, University of Wisconsin; *Exhaust Gas—Forum on Exhaust Gas Analysis*.

### Society of Automotive Engineers NATIONAL DEFENSE DAY PROGRAM

#### Land Transportation

"Automotive Ordnance," by Major General C. M. Wesson, Chief of Ordnance.

"Military Motor Vehicles—The Problems of the Quartermaster Corps," by Major General Henry Gibbins, Quartermaster General.

#### Air Transportation

"Trends in Aircraft and Engine Performance," by Brigadier General Henry H. Arnold, Chief of the Air Corps.

"Mutual Problems of Military and Civil Aviation in the Field of Air Transportation," by Captain John Towers, Assistant Chief, Bureau of Aeronautics.

#### Dinner

"Industrial Mobilization for National Defense," by Brigadier General C. T. Harris, Jr., Assistant to the Chief of Ordnance.

craft Engine Mounting, by K. A. Browne, Wright Aeronautical Corp.; *Aircraft Engine Valve Mechanisms*, by V. C. Young, Wilcox-Rich division of Eaton Mfg. Co.; *Transportation and Maintenance—Safety Lane Testing*, by J. F. Winchester and J. J. Powelson, Standard Oil Co. of New Jersey; *Compulsory Vehicle Inspection from the Safety Viewpoint*, by Sidney J. Williams, Public Safety division, National Safety Council; *Filtering Fallacies*, by Austin M. Wolf, automotive consultant, New York City; *Aircraft—High Lift Devices*, by Otto C. Koppen, Massachusetts Institute of Technology; *A Summary of N.A.C.A. Investigations of High-Lift Devices*, by Carl J. Wenzinger, National Advisory Committee for Aeronautics; *Composite Wood and Plastic Propeller Blades*, by F. E. Weick, Engineering and Research Corp.; *Junior-Student—Sub-Stratosphere Flying*, by D. W. Tomlinson, Transcontinental and Western Airlines; *Progress in Television*, by A. F. Murray, Philco Radio and Television Corp.; *Passenger Car Engine—Symposium on Troubles from Varnish in Engines*, presented by F. F. Kishline, Willys-Overland Motors, Inc.; *Welded Steel Cylinder Blocks*, by Everett Chapman, Lukenweld, Inc.; *Fuels and Lubricants—Power Loss Accompanying Detonation*, by Neil MacCoull, The Texas Co.; *Spark Timing and Its Relation to Road Octane Numbers and Engine Performance*, T. B. Rendel and L. E. Hebl, Shell Petroleum Corp.; *Fuel and Lubricant Requirements for Gasoline Compression-Ignition and Spark-Ignition Oil Engines*, by J. B. Fisher, Waukesha Motor Co.; *Multi-Cylinder Engine Knocking and Distribution*, by A. J. Blackwood,

## FEDERAL HONORS STARS

• Members of the Star Salesmen's Club of the Federal Motor Truck Co. held their 1938 meeting at the Detroit Leland Hotel on Dec. 12 and 13. These 24 salesmen, who were responsible for more than \$750,000 of truck sales during 1938 were honor guests of the company at a banquet on Dec. 12, attended by officials of the company and some of its principal suppliers.

K. M. Schaefer, general sales manager, awarded prizes to three individual leaders: Marion Brautlatch, Roberts Motor Co., Portland, Ore.; G. C. LaJoie, Canada Motor Car Co., Montreal, Que.; and R. E. Hershey of the company's Newark, N. J. branch.

In a brief discussion of sales prospects in the truck field during 1939, Ray W. Rudon, president, emphasized that announcement of addition of a ¾-ton light-duty truck to the Federal line soon after the first of the year is being counted on materially to add to the company's anticipated increase in sales.



## BUSINESS IN BRIEF

Written by the Guaranty Trust Co., New York

General business activity was well sustained last week, and expansion in various branches of enterprise apparently continued. The *Journal of Commerce* index for the week before, ended Dec. 3, measuring recovery from the let-down in the week which included Thanksgiving day, advanced to 90.0 from the revised figure of 87.2 for the preceding week

that cannot be maintained. It causes dissatisfaction.

"Our experience in General Motors has taught us that the best plan is the biggest pay envelope that is possible, under any particular circumstances, supported by the maximum possible protection against the business cycle, the seasonal trend and incapacity to work due to the vicissitudes of life. Anything that can be done in the way of promoting these general objectives, from the tax incentive principle, is both socially and economically desirable."

Mr. Sloan told the committee that it was his view that the best application of the tax incentive principle appears to be "a reduction of the general taxes on business." He gave as the reason that such a move would have the economic effect of reducing prices and stimulating greater productivity of industry, which he said results in the expansion of present units and the development of new products so essential to an advancing standard of living. All this, he testified, means increased employment.

Concluding Mr. Sloan's prepared statement, he was questioned briefly by both senators. "The only way you can raise wages is by increased productivity per man," he explained, in response to a question. "It can't be done in any other way. It doesn't matter how much you increase wages, prices go up, too, unless productivity increases also."

"Your comments and suggestions," declared Senator Vandenberg, "have been a big help to this committee."

and compares with 78.6 a year ago.

A mounting volume of Christmas buying last week carried retail sales to new high levels for the current recovery period, although the total values represented remain somewhat below corresponding 1937 figures. In wholesale markets some decline in orders for spring merchandise was noted, offset by rush orders for holiday goods.

The Federal Reserve Board's sea-



sonally adjusted index of industrial production rose from 96 per cent of the 1923-25 average in October to slightly more than 100 in November. This is the highest monthly figure recorded since October, 1937, and compares with an average of 77 for the second quarter of this year.

An increase of 87,002 cars in railway freight loadings in the week ended Dec. 3, following a decline in the preceding week, brought the total to 649,086 cars, as compared with 657,477 cars in the week before Thanksgiving and 620,325 cars in the comparable week last year.

The output of electricity by the power and light industry in the same week, although recording a less than seasonal recovery from the holiday influence of the week before, widened the gain above comparable production last year to 6.2 per cent.

Estimated average daily production of crude oil in the week ended Dec. 3 was 3,223,650 barrels, or 37,250 barrels less than the average for the preceding week, and compares with current requirements of 3,305,800 barrels, as computed by the U. S. Department of the Interior.

The average daily production of bituminous coal in the same week was 1,408,000 tons, as compared with 1,520,000 tons in the preceding week, but was 61,000 tons above the average a year ago.

Reported lumber production, shipments, and new orders were all greater in the week ended Dec. 3  
(Turn to page 785, please)

## New Truck Registrations

For the month of October, 1938, new truck registrations aggregated only 19,589 units, decreasing slightly more than 26 per cent from the total for the preceding month and approximately 52 per cent as compared with October a year ago. The showing for the first 10 months of 1938 against that of the similar period in 1937 is expressed by a -44.5 per cent.

	October	September	October	TEN MONTHS		Per Cent Change, 10 Months, 1938 over 1937	Per Cent of Total Ten Months	
	1938	1938	1937	1938	1937		1938	1937
Chevrolet	3,828	6,577	10,745	98,021	164,852	-30.4	31.63	29.46
Ford	4,968	8,296	10,277	86,725	176,981	-51.0	27.98	31.63
International	5,104	5,296	6,522	47,816	66,818	-28.5	15.43	11.94
Dodge	1,564	2,285	5,142	29,970	56,708	-47.1	9.67	10.13
G. M. C.	1,306	1,513	3,238	17,172	39,175	-56.1	5.54	7.00
Plymouth	306	391	984	6,170	12,278	-49.6	1.99	2.19
Diamond T.	419	318	486	3,757	7,346	-48.8	1.21	1.31
Mack	512	353	436	3,493	7,856	-55.8	1.13	.87
White	291	269	589	2,924	5,205	-43.8	.94	.93
Reo	285	252	283	2,503	3,806	-34.1	.81	.68
Studebaker	162	167	265	1,695	4,763	-64.4	.55	.85
Willis-Overland	140	143	55	1,668	858	+94.5	.54	.15
Autocar	135	129	195	1,364	1,880	-27.5	.44	.34
Federal	100	135	166	1,171	2,122	-44.9	.38	.38
Brockway	135	123	129	1,077	1,372	-21.6	.35	.25
Divco	76	88	98	1,045	1,054	-1.0	.34	.19
Hudson	26	28	267	660	4,580	-85.7	.21	.82
Indiana	26	34	91	380	1,032	-69.3	.12	.22
Stewart	45	30	78	344	1,032	-66.7	.11	.18
F. W. D.	13	17	42	246	383	-35.2	.08	.07
Pontiac	2	7	7	209	209	0.0	.07	.07
Sterling	19	19	20	209	287	-27.1	.07	.05
Stutz Pak-Age Car	1	1	30	93	567	-83.5	.03	.10
Miscellaneous	120	99	127	1,218	1,430	-15.0	.38	.26
Total	19,589	26,570	40,426	309,932	559,592	-44.5	100.00	100.00

## Estimated Dealer Stocks of New Passenger Cars

1937	January	February	March	April	May	June
Production—U. S. Domestic Market	285,749	276,469	376,245	410,592	400,415	387,121
Retail Sales—U. S.	249,715	216,770	409,205	387,687	407,610	365,160
Change in Inventory	+36,034	+59,699	-32,960	+22,705	-7,195	+21,961
Inventory, first of month	248,200	284,234	343,933	310,973	333,678	326,483
1937 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market	341,189	299,496	110,122	273,753	269,580	212,655
Retail Sales—U. S.	347,120	310,312	192,967	212,651	212,389	171,643
Change in Inventory	-5,931	-10,816	-82,845	+61,102	+57,191	+41,012
Inventory, first of month	348,444	342,513	331,697	248,852	309,954	367,145
1938	January	February	March	April	May	June
Production—U. S. Domestic Market	130,273	119,896	153,316	160,028	140,239	123,333
Retail Sales—U. S.	126,442	120,348	188,325	193,392	187,306	155,811
Change in Inventory	+3,831	-452	-35,009	-33,364	-47,067	-32,478
Inventory, first of month	408,157	411,988	411,536	376,527	343,163	296,096
1938 (continued)	July	August	September	October	November	December
Production—U. S. Domestic Market	96,975	53,955	60,177	171,371	.....	.....
Retail Sales—U. S.	153,426	123,711	90,629	134,668	.....	.....
Change in Inventory	-56,451	-69,756	-30,452	+36,703	.....	.....
Inventory, first of month	263,618	207,167	137,411	106,959	143,662	.....

†—U. S. Census Bureau.

‡—Automobile Manufacturers Association.

## Automotive Metal Markets

### Steel Mills Near End of Low-Price Commitments to Car Makers; Ingot Output of 28,000,000 Tons Forecasted for 1938

With flat rolled steel mills nearing the end of their low-price commitments to automobile manufacturers, fill-in orders, booked at full prices, while not furnishing adequate replenishment, provide in the aggregate an encouraging end-of-the-year volume of business. It is recognized that announcement by virtually all steel producers of unchanged prices for next quarter's shipments will be subjected to a severe test when, as is confidently

expected, the large automobile manufacturers sound the market next month for prices on round tonnages of sheets and strip steel.

While the rate of employed ingot capacity slipped further this week, the American Iron & Steel Institute reporting it at 57.6 per cent, making the decline within the last four weeks nearly 10 per cent, finishing mills catering to the automotive industry continue to make a very good showing. The production rate in the Detroit area is estimated at 84 per cent of capacity, which indicates considerable pressure for deliveries on the part of automotive buyers.

With the end of the year in sight, statisticians forecast an ingot output in 1938 of 28,000,000 tons, compared with 48,000,000 in 1937. As a whole, therefore, 1938 will go down in history as what is usually referred to as a "bad" steel year, but it will be notable for the recovery staged during the year's second half when buying by automobile manufacturers and parts makers lifted the demand for flat rolled light steel very close to one-half of the steel industry's entire tonnage output. A slight upward revision in prices of upset hexagon cap screws and square head set screws and of some sizes of semi-finished hexagon nuts was announced early this week, becoming immediately effective.

Announcement by the International Copper Committee of a cut in  
(Turn to page 785, please)

## News of the Industry

### WHAT ARE THEY DOING?

**DR. HUGH L. DRYDEN**, chief of the mechanics and sound division of the National Bureau of Standards, Department of Commerce, will deliver this year's "Wright Brothers Lecture" at Columbia University, New York, on Dec. 17, 1938.

**LIEUTENANT-COMMANDER G. O. NOVILLE**, companion of Admiral Richard E. Byrd in his Arctic and Antarctic expeditions, and **E. J. RIVERS**, former executive of the North American Aviation Co., have been given direction of Continental Aeronautic Corp., Los Angeles, a subsidiary of Continental Motors of Detroit, which will establish a new airplane parts factory at Burbank, Calif. A tract of 23½ acres, with a structure having 161,000 sq. ft. of floor space, has been leased.

**FRANK P. SNYDER** has been named as sales representative in the Detroit area for the Alexander Milburn Co., manufacturer of spray finishing equipment and cutting and working apparatus.

**WALTER B. STRONG**, formerly manager of the export division of the Worthington Pump & Machinery Corp., has been appointed assistant general sales manager.

**ALTON F. BAXTER**, president of the Unit Parts Corp., was reelected president of the National Automotive Parts Association at the annual convention in Chicago.

**N. GOLDSMITH**, formerly with Simmons Mfg. Co., has joined the Arrow Muffler Co., Chicago, as sales manager.

**CARL B. SQUIER**, vice-president in charge of sales for the Lockheed Aircraft Corp., has been elected a director of the Vega Airplane Co., Burbank, Calif. The Vega Airplane Co., now engaged in

manufacturing a new type medium-sized airplane, is a subsidiary of the Lockheed Corp. and was organized several years ago to develop a small airplane for private owners or executives.

### ADVERTISING NEWS NOTES

● Frank W. Lovejoy, director of retail marketing Socony-Vacuum Oil Co., New York, was the dinner speaker at the Advertising and Sales Club of Hamilton, Ont., host to delegations of advertising clubs of Toronto, London, Waterloo, Kitchener, Erie, Buffalo, and officers of the Advertising Affiliation at its annual Inter-Club night.

● W. A. James, director of advertising for the Hudson Motor Co., Detroit, recently addressed a luncheon in Toronto, Ont., tendered to advertising and newspaper men and women.

● An unusual method of securing original, amusing advertisements for a campaign in Canadian College publications has been inaugurated by N. W. Ayer & Son of Canada, Ltd., Toronto, Ont., for the Ford Motor Co. of Canada, Ltd., Windsor, Ont. College students in 10 Canadian universities have been invited to submit illustrated layouts suitable for black and white reproduction, featuring the Ford V-8. Five advertisements will be selected from those submitted, and will be purchased by the agency. This series of advertisements will be used in college publications during February, March and April next year.

● Glenn Griswold, recently resigned as publisher of *Business Week*, has announced the formation of Glenn Griswold Associates for the practice of public relations, specializing in the industrial field. Principal offices have been opened in the McGraw-Hill Building, 330 W. Forty-second St., New York, with a branch office at 520 N. Michigan Ave., Chicago.

## Automotive School

### AMA's Reeves Speaks at Dedication of \$3,000,000 Building

Prominent individuals in the automotive industry attended this week the dedication exercises of the new \$3,000,000 Brooklyn High School of Automotive Trades. Alfred Reeves, vice-president of the Automobile Manufacturers Association and featured speaker at the ceremonies, commented that "Complete courses of training for mechanics are maintained by the factories, but they cannot begin to supply the demand for young men with a trained understanding of automobiles to work in repair shops, garages, filling stations as well as automobile dealerships. For that reason schools in all the larger cities are doing splendid work in providing educational facilities for the driving, care and repair of automobiles."

This latest addition to New York City's educational system has a frontage of 400 ft., a depth of 250 ft. and is four stories high. There are approximately 10 acres of floor space. The general construction cost \$1,100,000, the equipment of cars and machinery over \$500,000, and including the site the total outlay by the city amounted to nearly \$3,000,000.

The building has 26 shops, an equal number of class rooms and the most modern appointments for

## New Passenger Car Registrations

An increase in new passenger car registrations during October of almost 17 per cent over September brought the month's total to 119,053. October, 1938, registrations, however, fell short

of the aggregate in the same month a year ago by approximately 70 per cent. For the 10 months of 1938 the total is 1,463,198, a decrease of 53 per cent as compared with this period last year.

	OCTOBER	SEPT.	OCTOBER	TEN MONTHS		Per Cent Change, 10 Months, 1938 over 1937	Per Cent of Total Ten Months		12 MONTHS MODEL YEAR		
	1938	1938	1937	1938	1937		1938	1937	1938	1937	Per Cent Change
Chevrolet.....	22,913	24,348	46,477	360,356	662,625	- 45.6	24.63	21.32	455,869	791,686	- 42.6
Ford.....	13,959	20,735	36,142	297,102	718,563	- 58.6	20.30	23.12	336,838	793,181	- 57.5
Plymouth.....	29,897	15,099	24,395	218,949	412,589	- 47.0	14.96	13.28	263,465	493,621	- 46.7
Buick.....	18,155	7,058	16,038	128,549	171,489	- 25.0	8.79	5.52	159,553	206,109	- 22.5
Dodge.....	3,578	3,545	16,981	76,812	229,647	- 66.5	5.25	7.39	100,420	266,850	- 62.5
Pontiac.....	6,064	3,131	13,817	72,659	189,516	- 61.6	4.97	6.10	93,554	217,560	- 57.0
Oldsmobile.....	3,159	3,394	10,854	66,995	168,157	- 60.2	4.58	5.41	85,176	188,728	- 54.8
Packard.....	4,613	2,673	5,584	40,096	84,646	- 52.7	2.74	2.72	50,157	97,742	- 48.6
Chrysler.....	1,769	1,576	6,973	35,387	79,259	- 55.4	2.42	2.55	46,950	90,296	- 48.0
Studebaker.....	5,405	3,081	4,855	32,036	62,347	- 48.6	2.19	2.01	39,017	73,076	- 46.5
Hudson.....	2,509	2,020	4,275	31,482	80,774	- 61.0	2.15	2.60	39,936	95,993	- 58.5
De Soto.....	1,388	1,500	4,867	27,174	65,241	- 58.4	1.86	2.10	35,739	73,361	- 51.2
Nash.....	1,620	1,977	3,191	26,210	63,225	- 58.6	1.79	2.03	31,387	66,233	- 52.6
Lincoln.....	816	873	1,343	13,629	21,803	- 37.5	.93	.70	16,849	25,194	- 73.2
La Salle.....	1,246	547	2,136	11,128	25,470	- 56.5	.76	.82	14,396	29,670	- 51.5
Willys.....	1,139	898	3,150	11,090	46,958	- 76.4	.76	1.51	15,307	48,166	- 68.2
Cadillac.....	493	416	613	7,983	9,974	- 20.1	.55	.32	9,122	12,192	- 25.0
Graham.....	188	237	925	3,425	12,624	- 72.9	.23	.41	4,700	14,902	- 68.4
Hupmobile.....	46	57	108	919	171	.....	.06	.01	1,133	1,913	+ 68.0
Miscellaneous.....	96	104	174	1,217	2,564	- 53.0	.08	.08	1,531	4,516	- 66.1
<b>Total.....</b>	<b>119,053</b>	<b>93,269</b>	<b>202,898</b>	<b>1,463,198</b>	<b>3,107,662</b>	<b>- 53.0</b>	<b>100.00</b>	<b>100.00</b>	<b>1,800,899</b>	<b>3,589,267</b>	<b>- 49.8</b>
Chrysler Corp.....	36,632	21,720	53,216	358,322	786,736	- 54.5	24.49	25.32	446,574	924,128	- 51.6
Ford Motor Co.....	14,775	21,608	37,485	310,731	740,366	- 58.0	21.24	23.82	353,687	818,375	- 56.8
General Motors Corp.....	52,030	38,894	89,935	647,670	1,227,231	- 47.1	44.26	39.49	617,470	1,445,943	- 43.5
All Others.....	15,616	11,047	22,262	146,475	353,329	- 58.5	10.01	11.37	183,168	400,821	- 54.2



## Census Statistics on U. S. Production of Engines

The appended data, supplementing those presented on pages 778 and 779 of this issue, were compiled by the Department of Commerce, Bureau of the Census. The information below is for the

year 1937 only, and does not include engines made for installation on ship or boats built or motor vehicles which are being manufactured by the same establishment.

	TOTAL			Number, by horsepower capacity (rated or normal, not overload)									
	Number	Rated horsepower capacity	Value	Less than 5	5 or more but under 10	10 or more but under 20	20 or more but under 50	50 or more but under 100	100 or more but under 200	200 or more but under 400	400 or more but under 600	600 or more but under 1,000	1,000 and over 5,000
Internal-combustion engines (except tractors):													
Injection engines:													
Compression-ignition (Diesel):													
Marine for direct connection to propeller shaft <sup>1</sup>	700	129,789	5,543,248			4	91	153	196	194	31	27	4
Marine for electric drive and auxiliary use <sup>1</sup>	214	50,436	3,314,522			41	53	42	32	8	10	9	19
Marine for connection to propeller shaft by reduction gearing	711	75,378	3,290,280			2	316	202	168		4	3	16
Stationary	5,942	592,505	17,309,783	60	202	296	885	2,271	1,765	316	55	57	35
Other Diesel (tractor, aircraft, railway Diesel-electric)	4,070	473,348	8,041,170			1	138	2,258	1,470	9	12	175	7
Surface-ignition, all types	8,462	366,535	4,083,428	371	14	3	6,125	1,673	273	3			
Carburetor engines:													
Aircraft	6,214	2,599,385	28,576,971				1,584	126	373	1,276	507	2,331	17
Marine, inboard <sup>1</sup>	10,347	615,475	3,203,663	78	169	454	3,797	4,918	767	148	16		
Marine, outboard <sup>1</sup>	77,549	327,522	4,359,822	65,603	8,168	1,227	2,543	8					
Automobile <sup>1</sup> (including taxicab and light truck and bus)	92,651	3,206,212	6,946,794				82,470	3,080	7,083	18			
Heavy truck and bus	12,483	1,123,694	4,330,403				725	7,619	4,139				
Tractor engines made for sale separately	34,149	1,625,795	5,047,511				27,939	6,210					
Railway cars	2,719	41,191	787,198	1,203	921	87	311	128	67	2			
Industrial engines:													
Portable	52,071	735,815	5,849,491	30,711	5,474	6,088	5,781	2,823	1,166	8			
Stationary	33,166	800,044	10,352,020	11,592	3,342	1,816	11,555	3,872	830	112	29	4	14
Other types of carburetor engines	254,979	2,626,072	13,536,877	201,849	3,079	5,828	22,633	20,309	1,212	69			
Mixing valve engines	20,503	116,573	4,824,171	20,071			163	22	47	119	38	21	22

<sup>1</sup> Not including engines made for installation in ships and boats built or motor vehicles manufactured by the same establishments.

an educational institution of its type, being one of the very few vocational schools in the country exclusively devoted to instruction in the automotive trades. Courses are open to boys from 14 to 20 years old who have graduated from the elementary schools.

Mr. Reeves declared that the new building was "one of the finest recognitions that the automobile industry has had in many years."

### Agriculture

(Continued from Page 779)

of those products. To the extent, furthermore, that automotive exports create jobs and purchasing power in the United States, the farmer will benefit directly through the increased sale of his products to the worker."

After reviewing the various measures designed to secure the return of farm prosperity to the United States, Mr. Smith urged the expansion of foreign markets—"as the one approach above all others that holds promise of success without attendant danger."

"The producer's problem of increasing his exports, whether of motor vehicles or of farm crops, is a problem of creating dollar exchange through imports," he stated, "just as the consumer's problem of

acquiring the things he needs from abroad is a problem of creating foreign exchange through exports. The two problems are reciprocal and interlocking, but from our own standpoint as producers the necessity may be stated by saying that we can find the new markets we are seeking only if imports of foreign goods are greatly increased, and that such an increase can occur, from this point on, only if our American tariff structure is revised on a safe, sound and intelligent basis."

Mr. Smith lauded Secretary of State Hull as a great statesman and said "his business-like dealing with the tariff problem has given us 19 trade agreements to date which have greatly expanded our exports, without harming, in the instance of the reciprocal imports, a single efficient industry or a single producer of basic commodities in the United States."

### Frederick A. Ingalls

Frederick A. Ingalls, vice-president of the Wyman-Gordon Co., Worcester, Mass., died recently at his home in Pebble Beach, Calif. Mr. Ingalls was the founder of the Ingalls-Shepard Forging Co. in Harvey, Ill., which was merged with the Wyman-Gordon Co. in 1919. He was in his eighty-third year.

## Labor

### Buick and Chevrolet Comply With UAW Demand for 32-Hr. Week

Reduction of working hours in two General Motors divisions and a proposed drive for increased hourly wage rates in all Chrysler divisions have become the major developments in current activities of the United Automobile Workers union.

In compliance with a union demand for a reduction of working time to four days or 32 hours weekly, officials of the Chevrolet and Buick divisions of General Motors have posted notices placing the shorter week in effect. The change became effective in Chevrolet divisions during the past week and will apply at Buick beginning with the week of Dec. 19.

Leo Lamotte, UAW regional director of all Chrysler locals, has announced that hourly wage increases ranging from 10 to 20 cents in almost all classifications will be demanded of Chrysler plants in Michigan. Notice has not yet been served on the corporation asking for a date to begin negotiations on the demand. Informed observers point to the approach of union elections, the need for issues to keep members interested, and a change in the State administration on Jan. 1 as possible reasons for present developments.

# News of the Industry

## RESEARCH IN GERMANY

GERMAN AUTOMOTIVE RESEARCH REPORT NO. 13. *Bremswerkuntersuchungen am Kraftfahrzeug (Research on Automotive Brake Installations)*, by Dipl.-Ing. H. Klaue. Published by VDI Verlag, Berlin NW 7, Germany.

The research work dealt with in this report was carried out in the Department of Road Vehicles at Brunswick Technical College, as part of a program that is being carried through by the Minister for Transport. The objects were to determine the effective friction coefficients between tire and road while braking the vehicle; to determine the effective friction coefficients between brake shoe and drum; to study the distribution of braking force between the different wheels and its influence on the deceleration obtained, and to investigate a brake-effort divider for hydraulic brakes proposed by the author, especially as regards its effect in preventing locking of wheels.

The brake-force divider consists essentially of a double-ended cylinder containing a piston which normally is held by a spring in such a position in the cylinder that the brake fluid, which must pass through the cylinder, can get to both the front and the rear brake cylinders. However, when the pressure in the hydraulic line attains a certain value, it overcomes the pressure of the spring in the "divider," and the piston therein then moves to a position in which it shuts off communication between the master cylinder and the rear brake cylinders. The plan is to have the spring pressure such that the rear brake cylinders are shut off just before the locking point of the brakes under normal road conditions is reached.

A good many of the road friction coefficient data, all for concrete roads, are from British and American sources. They show that the coefficient decreases with an increase in speed, and that it is greater when the wheel is still rolling than when it is locked. There is some uncertainty in the data as to whether the friction coefficient is greater when the pavement is dry or wet, which is probably due to the fact that the friction coefficient of a wet concrete pavement depends very much upon whether the pavement is clean or covered by a film of oil or other lubricant.

With the author's brake divider for hydraulic brakes a maximum deceleration of 26.5 ft. per sec.<sup>2</sup> was obtained, as compared with 26 ft. per sec.<sup>2</sup> under similar conditions without the divider.

GERMAN AUTOMOTIVE RESEARCH REPORT NO. 17: *Influence of the Conditions of Distillation on the Ignition Quality of Diesel Fuels derived from Lignite Low-Temperature Tars*, by Dr. Richard Heinze and Dr.-Ing. Kurt Schneider. Published by VDI Verlag, Berlin NW-7, Germany.

In research work on Diesel fuels it has been found that the ignition quality varies inversely as the density of the constituent hydrocarbons, and therefore directly as their parachor and their boiling point. This relationship gave the authors the idea that it must be possible to improve the ignition quality of Diesel fuels obtained from lignite tars by a suitable choice of the fraction used and of the conditions of distillation. The work done by the authors confirmed the theory propounded by Boerlage and Broeze that the ignition quality of Diesel fuels is dependent on the molecular weight of the hydrocarbons of which the fuel is composed.

It was found that the fraction of lignite tar distillate passing over at between 500 and 645 deg. Fahr. is best for use in Diesel engines. The ignition quality is the highest if distillation is effected at from one to three atmospheres pressure with-

out catalysts, and at two atmospheres pressure with catalysts. Diesel fuels thus obtained have a cetane number of about 50, whereas the product obtained by vacuum distillation has a cetane number of only 40. At the moderate pressures recommended a slight cracking of the high-boiling-point hydrocarbons takes place, into hydrocarbons within the boiling range found most suitable for Diesel fuels. It is said that until now it has been the general opinion that vacuum distillation is best for the production of Diesel fuels from lignite tars.

The report deals with the problem of ignition quality of Diesel fuels in general, describes the experimental work of the authors, which was carried out in the Laboratory for Lignite and Petroleum Research at Berlin Technical College, gives the results obtained, and outlines a proposed method for the production of Diesel fuel from lignite low-temperature tar.

## GOVERNMENT PURCHASES

• Government purchases of transportation equipment, as reported by the Public Contracts Board for the week ended Dec. 3, totaled \$239,991. The awards were:

For trucks—Yellow Truck & Coach Mfg. Co. (G.M. Truck & Coach Div.), Pontiac, Mich., \$187,140; Automobile Sales Co., Inc., Memphis, Tenn., and Lansing, Mich., \$26,507; propeller blades—Hartzell Propeller Co., Div. of Hartzell Ind. Inc., Piqua, Ohio, \$15,900; nuts, bolts, etc.—The Cleveland Pneumatic Tool Co., Cleveland, Ohio, \$10,444.

For tractors—Caterpillar Tractor Co., Peoria, Ill., \$13,994.

Miscellaneous award announced during the same period: For gyro compass equipment—Sperry Gyroscope Co., Inc., Brooklyn, N. Y., \$76,081.

## GM'S NOVEMBER SALES

• November sales of General Motors cars and trucks from all sources of manufacture totaled 200,256 compared with 195,136 in November a year ago. Sales in October were 123,835. Sales for the first 11 months of 1938 totaled 1,119,840 compared with 1,956,453 for the same 11 months of 1937.

Sales to dealers in the United States totaled 159,573 in November compared with 153,184 in November a year ago. Sales in October were 92,890. Sales for the first 11 months of 1938 totaled 785,158 compared with 1,571,792 for the same 11 months of 1937.

Sales to consumers in the United States totaled 131,387 in November compared with 117,387 in November a year ago. Sales in October were 68,896. Sales for the first 11 months of 1938 totaled 882,882 compared with 1,504,533 for the same 11 months of 1937.

## CONVENTIONS AND MEETINGS

SAE Annual Meeting, Detroit....Jan. 9-13

## SHOWS AT HOME AND ABROAD

Grand Rapids, Mich., Automobile Show .....Jan. 2-7

National Motor Boat Show, New York, Jan. 6-14

Seattle, Wash., Automobile Show, Jan. 9-15

Berlin, Germany, Automobile Show, Feb. 17-March 5

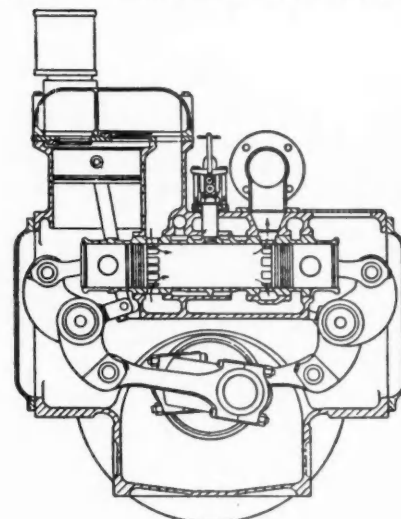


**TRAFFIC LIGHT** shown at the inventors' Congress held recently at Los Angeles, Calif. The five red lights on the top indicate so many seconds before the green light flashes; similarly, five green lights on the bottom indicate the seconds remaining before the red lights turn on.

## Abstracts

(Continued from page 777)

bearings are used on the piston pins and in the walking beams. The crankshaft has double, opposite throws for each cylinder, so that the two pistons in each cylinder move in opposite directions. However, the two crankpins are not exactly opposite, and the motions of the two pistons is slightly out of phase, so that while the exhaust ports open before the inlet ports, they also close before the inlet ports. Scavenging is effected by means of a short-stroke piston pump which is driven from one of the walking beams through a short arm and link. Injection pump and nozzle



Sulzer two-stroke, opposed-cylinder engine.

zles are products of the Sulzer firm. The accessories-drive shaft is driven from the crankshaft through gears and is entirely enclosed. This accessories-drive shaft drives the injection pump, and where the engine is started by compressed air it carries the cams for the admission and exhaust of the starting air. At one end it carries a ball-type centrifugal governor.—ATZ, Oct. 25.

### Ernest J. Beyer

Ernest J. Beyer, executive office and production division of the Bendix Aviation Corp. for 26 years, died Dec. 7 at Grace Hospital in Detroit.

### Metal Markets

(Continued from page 781)

production quotas has so far failed to revive consuming interest in the metal. The export price, however, rallied to 10⅞ cents. In the "outside" market spot electrolytic was offered at that price, without attracting buyers. Mine producers and custom smelters continue to quote 11¼ cents, but dealings are largely confined to takings by subsidiaries of the large producers. Speculative sentiment in London has turned bearish and looks for a mark-down in price by American producers.

Tin has turned listless, minor fluctuations in response to ups and downs in Sterling exchange being noted daily, with 46 cents for spot Straits the average.—W. C. H.

### Business

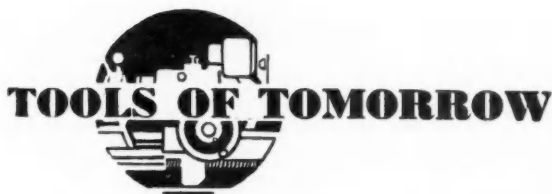
(Continued from page 781)

than in the week before—the respective gains being 9 per cent, 17 per cent, and 2 per cent. Production was equal to 61 per cent, shipments 86 per cent, and new orders 99 per cent, of the corresponding 1929 figures.

Professor Fisher's index of wholesale commodity prices for the week ended Dec. 10, registering the widest fluctuation in four months, declined six fractional points to 79.8 per cent of the 1926 average, the lowest level reached this year. The year's peak figure of 83.9 was for the second week in January.

Member bank reserve balances increased \$89,787,000 in the week ended Dec. 7, while total bills discounted by the Federal Reserve banks declined \$1,038,000 and industrial advances declined \$336,000. Estimated excess reserves of the member banks, increasing by \$60,000,000, again established a new peak \$3,444,000,000.

*Automotive Industries*



### Press

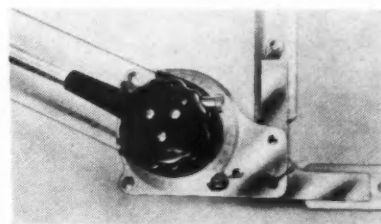
*... Power Applied to Four Corners of Slide Through Connections Operating Simultaneously From Two Crankshafts*

The large Cleveland power press shown on this page is a further development of the 275-D line of four point suspension presses made by the Cleveland Punch & Shear Works Co., Cleveland. In these presses the power is applied to all four corners of the slide through connections operating simultaneously from two crankshafts. The advantage of this construction, as pointed out by the manufacturer, is that accurate alignment is maintained between the slide and the bed, whether the work is in the center or off center, so that there is little possibility of the dies overlapping.

The press, which has a bed area of 94 in. by 208 in., is equipped with an electrically controlled, hydraulically operated clutch and all of the electrical equipment with the exception of the controls is located in the housings.

The press is designed to operate with an automatic roll feed which has supplementary rolls for leveling and straightening the material before it reaches the dies, and a heavy-duty automatic uncoiler. It is capable of feeding 180 in. of 72 in. material at each stroke of the press operating at 10 r.p.m.

Feed arrangement and press operation are synchronized through an interlocking system so that in the



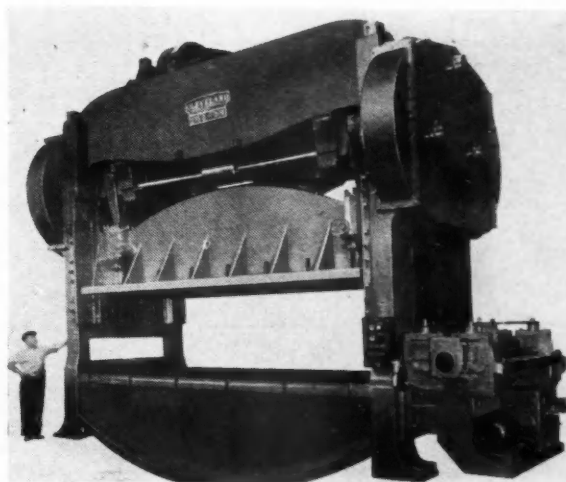
Bruning-Wallace touch control drafters

event that the correct amount of material has not been fed the predetermined distance, the press will stop automatically and remain stopped until correction is made and the operator starts the press again.

### Drafting Machine

*... Bruning Equipment Has "Touch Control" of Protractor Head.*

Something new in drafting machines is the Bruning-Wallace touch control drafter recently announced by the Charles Bruning Co., New York. A "Touch Control" button on the protractor head of the machine is located conveniently under the draftsman's thumb. A touch on this button releases the head, allowing it to rotate freely to the desired setting. Simply lifting the thumb locks the head positively at the desired automatic index stop. A slight turn of the control button allows "free wheeling," enabling the head to rotate freely.



Cleveland power press in which power is applied to all four corners of the slide through connections operating simultaneously from two crankshafts.

December 17, 1938



## Ourselves and Government

### Oral Arguments in Steel Wage Case to Start Dec. 20; Fair Trade Rules Soon to Be Submitted for Approval

A weekly check list of legislative, executive and judicial actions affecting the automotive industries. First appeared in June 25 issue, p. 831. Corrected to Dec. 15.

#### Legislative Legacies

**MONOPOLY STUDY.** After hearing spokesmen for the automobile industry early last week, the Temporary National Economic (anti-monopoly) Committee recessed until Dec. 12, when it opened its study of the glass container industry's patent policies by hearing representatives of the industry.

#### DEPARTMENT OF LABOR

**STEEL WAGES.** Public Contracts Board, whose job is to fix minimum wages and maximum hours in industries doing Government business, has extended until Dec. 19 the date for filing briefs in the steel wage case and has scheduled oral argument for Dec. 20. Protests against the Board's recommendations of Nov. 5, which called for a minimum rate of 62.5 cents in 36 states in the North and 45 cents in 12 states in the South, already have been filed by companies representing the bulk of the industry's tonnage.

**WAGES AND HOURS.** Administrator Elmer F. Andrews is preparing to "crack down" on violators of the wage-hour law by referring one or two of the most

flagrant cases to the Department of Justice for prosecution. Special attention, an announcement said this week, is being given "serious violations" by firms in Connecticut, Georgia, Illinois, Minnesota, Mississippi, Missouri, North Carolina and New York.

#### FEDERAL TRADE COMMISSION

**FAIR TRADE PRACTICE** rules for retail automobile dealers, introduced at public hearings during last NADA meeting in December (see A. I., April 30, 1938), are expected to be submitted to the Commission shortly for approval. Completion of work on several pending cases, before the FTC's Trade Practice Division will enable the division to start where it left off several months ago on the automobile rules.

**SIX PER CENT CASE.** Commission continues to defer setting final argument in the Ford case. Briefs from the FTC and the company are in. In the GM case, the company has filed its brief. FTC due to file its brief Dec. 30. Cases involve FTC allegation that companies engaged in false and misleading representations in advertising financing plans.

**FOB PRICE CASE.** Hearings on the Ford case started Nov. 29, have since been recessed and may continue in Washington. The proceeding involves Commission charges that price advertising is mislead-

ing because of failure to include standard equipment in the advertised price. GM brief already filed, and hearings expected to start sometime in January.

**VS. G-M.** Alleged unfair competition and practices tending to create monopoly in the sale of automobile parts, accessories and supplies. Hearings continued at Brooklyn. John L. Hornor, trial examiner; Everett F. Haycraft, FTC attorney.

#### NATIONAL LABOR RELATIONS BOARD

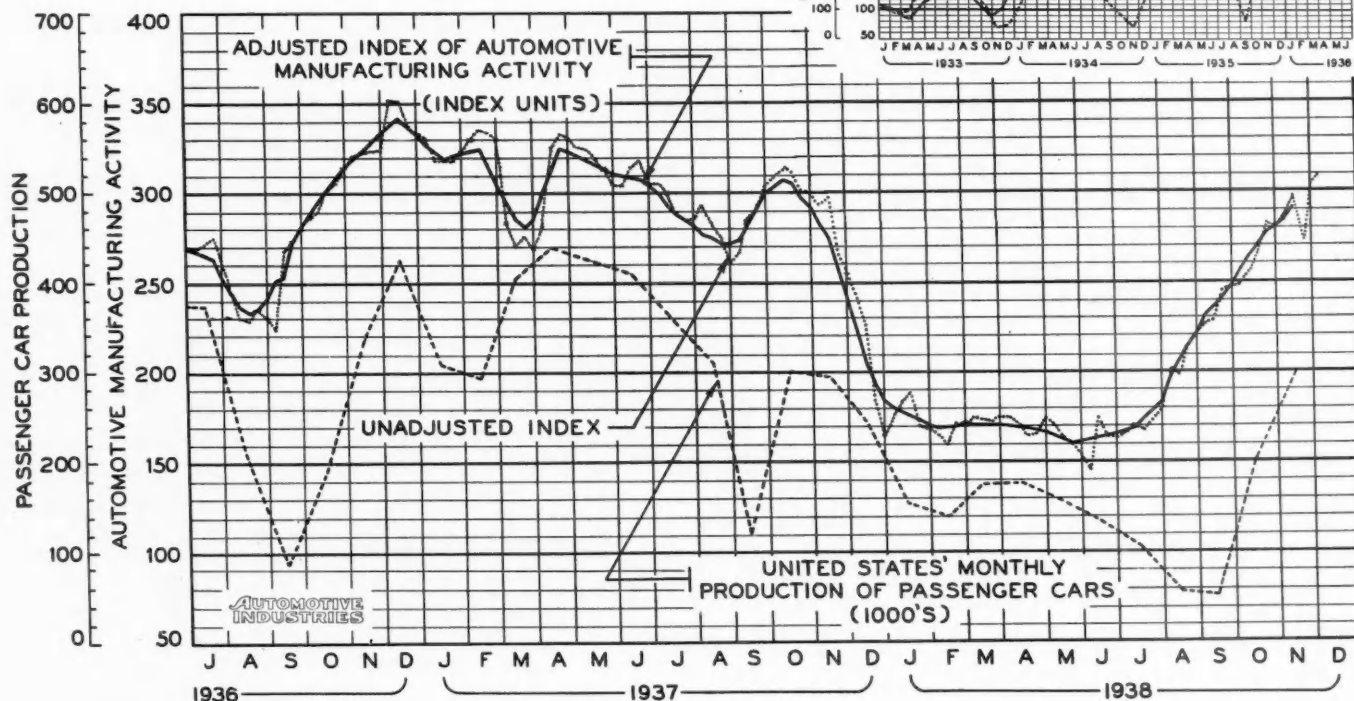
The NLRB has directed the Douglas Aircraft Co., Inc., Santa Monica, Calif., to discontinue the alleged practice of discouraging membership in the United Automobile Workers of America, and to refrain from recognizing as a collective bargaining agency the Aircraft Workers Union, Inc., which the board said was supported and dominated by the company.

Under the order, the NLRB said, the company must reinstate with back pay 32 employees and award back pay to 13 sit-down strikers.

Charges that the company discriminated against the five UAW members were dismissed by the board.

NLRB has ordered the Muncie Gear Work, Inc., Muncie, Ind., to stop discouraging membership in the United Automobile Workers of America, Local No. 459 (CIO), and to disestablish the Muncie Gear Employees Association as a collective bargaining agency. Under terms of an accompanying stipulation, the company agreed and the board ordered it to award the sum of \$200 each to two employees, and to reinstate them to their former positions without prejudice.

## Automotive Activity Index Moves Upward Five Points to 309 Mark



Continuing the upward movement reestablished during the week ended Dec. 3, the index of manufacturing activity climbed to an unadjusted figure of 309 for the week ended Dec. 10. This is an increase of five points over the preceding week.

The adjusted index curve, going ahead at approximately the same rate since the first of August this year, tapered off somewhat due to the dip in the unadjusted index curve two weeks ago and now registers 291.

# Just Among Ourselves

## A Good Job Well Done

THIS week saw the concrete realization of the General Motors-Cornell World Price Index, about which we said something on this page a few weeks ago. (Oct. 22 issue, p. 497.) A remarkably lucid and complete explanation of the philosophy back of the Index is contained in a booklet issued by the Public Relations Department of General Motors. If you've ever been concerned personally with the collection of data from scattered sources, you will realize what an undertaking is involved in publishing *weekly* reports on price fluctuations from many corners of the world. It's an interesting example of a job which might be undertaken by governmental sources, but which, if it were, would be immersed in a Sargasso sea of red tape which would slow up its workings. Streamlined private management, working quietly for a year or more, has produced another example of what can be accomplished where vision is backed by initiative and organization.

## Where Things Move People Congregate

THE Automotive Service Industries Show in Chicago a week ago testified again to the magnitude and virility of the maintenance end of the business. There were fewer exhibitors than at last year's show, but even more exhibits-in-action, and it was apparent once again that where something moves, people gather. Of the hundreds of exhibits, one seemed outstanding to me from the standpoint of its bearing on the future of motor-vehicle design. I have felt for years that one of the outstanding needs of most motor vehicles was a satisfactory, automotive anti-roll device; to prevent the vehicle from rolling backward when brought to a stop on upgrades. Studebaker is currently the only car which carries such a device as standard equipment. Manufacturing parents of the NoRol are Wagner Electric and Delco Products. It is now being

pushed for installation on a limited series of models in the after-market. I record once again my earnest hope that this will arouse sufficient public interest to make the factory installation of such devices a "must" in the near future. The present design is not necessarily the ultimate answer, but it is certainly one of the possible satisfactory solutions.

## Figures in the Air— Economists Pitching

FROM Tuesday, Dec. 27 to Friday, Dec. 30 the Detroit air will vibrate with the deliberations of the American Statistical Association, the Econometric Society, the American Economic Association, and many other national groups with a scientific interest in the economic welfare of the nation. Because the meetings are being held in Detroit, the programs will contain many presentations of interest to the automobile field. It is safe to say that automobile economics has not had such an airing for a decade. There are many other things on the program, not specifically automotive, which might be of interest to the far-seeing executive.

## Says Sloan— Little Can Be Said

IN a letter to General Motors' stockholders, date Dec. 10, Alfred P. Sloan, Jr., remarks that "little can be said . . . with regard to the fundamental trend of consumer demand. As stated in the third quarterly (GM) report, there is a definitely better attitude on the part of the consumer. And, at the moment, a strong initial demand exists for all the corporation's 1939 motorcar products. With that initial demand satisfied, as those products are now in production on a volume basis, the question arises as to how stable this better demand will be found to be. Sufficient facts are not yet available to make any definite answer to that question."

—HERBERT HOSKING



In order to give readers of *AUTOMOTIVE INDUSTRIES* a clue to certain merchandising and service aspects of the automotive industry which are normally outside the scope of an industrial publication, we present herewith excerpts from the December issues of the four other magazines published by the Automotive Division of the Chilton Co.

#### FROM MOTOR WORLD WHOLESALE

*Governmental activity as it affects the distribution of automotive products in 1939 will be centered largely in the Temporary National Economic (anti-monopoly) Committee and the Wages and Hours Division of the Department of Labor for some months to come.*

*By virtue of the Federal Trade Commission's authority in administering the Robinson-Patman anti-price-discrimination statute, and the Tydings-Miller resale price fixing measure, the F T C is pointing the way to what it wants done in the way of tightening some of these laws, relaxing others and abandoning at least one completely.*

#### FROM COMMERCIAL CAR JOURNAL

*What is the object of motor truck show? Is it solely to attract prospects that can be turned into sales? If that is to be the purpose the show idea should be wrapped up neatly and dropped into the nearest ashcan.*

*The prime object of a show should not be to sell trucks to the public but to sell the public on trucks. A truck show should be educational—and let the sales fall where they may.*

#### FROM MOTOR AGE

*There are many stunts that will help to bring in business to the automotive repair shop, but to keep that business requires good mechanics that will do the*  
(Turn to page 800, please)

BY P. M. HELDT

**T**HE progress which has been made in the design and production of automotive transmission and drive gears during the past twenty-five or thirty years can best be visualized by comparing the sizes of transmissions fitted to cars about 1910 and those used today, on a horsepower basis. The 1910 model of a well-known make of passenger car, of 32-hp. rating, had a transmission with a shaft-center distance of 4 in. and a distance between bearings on the main shaft of approximately 9 in. Today cars with three times the nominal horsepower have transmissions with a shaft-center distance of only a little over 3 in. and a distance between front and rear bearings of about 7 in.

This tremendous decrease in the relative size of transmissions is, of course, in large measure due to the higher speeds of operation of modern engines and cars. However, when this is allowed for, there still remains a great deal that must be credited to improved materials and improved production methods.

Some of the earliest sliding gear transmissions had gears of carbon steel, case-hardened, but this material has long been discarded, and alloy steels are now used exclusively for the gears of the transmission and those of the rear-axle drive. There are essentially five types of alloy steel—falling in the “20”, “30”, “40”, “50” and “60” hundred classes of the S.A.E. steel specification tables—which lend themselves to use in automotive transmission and rear-axle gears. These are the straight nickel steels, chrome-nickel steels, nickel-molybdenum steels, chromium steels, and chrome-vanadium steels. This classification is based on the nature of the alloying elements the steel contains. However, under each of these headings there are low-alloy and high-alloy, or low, medium, and high-alloy steels, and, finally, all of the alloy gear steels fall into either the low-carbon case-hardening, or the medium-carbon direct-hardening group. The low-alloy steels generally give a certain improvement over carbon steels with respect to fatigue

strength and resistance to growth or warping, and the high-alloy steels represent a further improvement in these respects, but their use is limited by their higher cost.

With the continual increase in engine power in automotive vehicles, it is only natural that a certain amount of trouble should have been experienced in connection with the gears that have to transmit the power. In the case of passenger cars, the service conditions of the transmission are somewhat alleviated by the fact that the power is

## GEAR

transmitted through the gears for only short periods at a time, whereas the rear-axle gears are under load continuously as long as the car is being driven. In heavy trucks and buses, whose “gradeability” in high gear is much lower, the power is transmitted through the gears of the transmission a much greater part of the time, and truck and bus service is generally considered heavy-duty service from the transmission standpoint.

The troubles which have been encountered with transmission gearing during the past decade have led to some very extensive investigations into the nature of gear failures and the effects of various



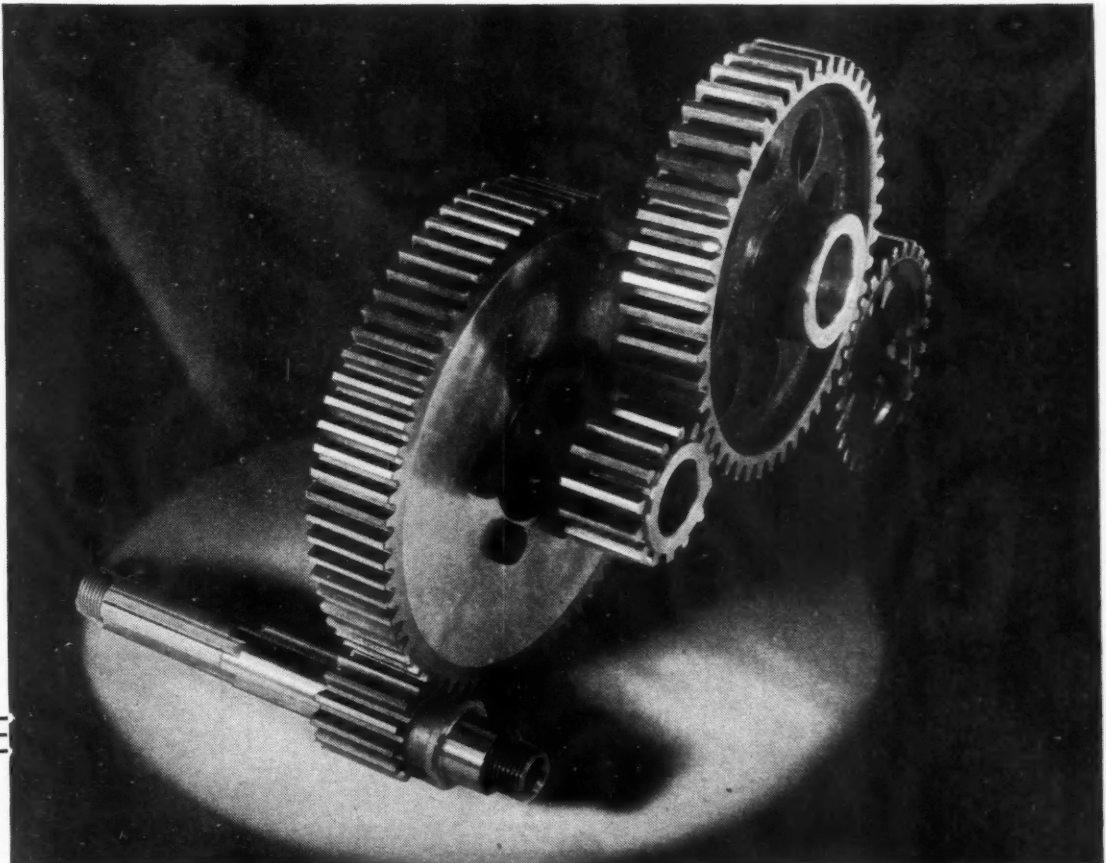
# Automotive <sup>22</sup> Materials

factors in inducing such failures. Attention should be called especially to a research project carried through by the International Nickel Company and reported upon by O. W. McMullan in a paper read before the National Metals Congress in 1935; and to research work carried out by General Motors Corporation and dealt with in a paper by J. O. Almen, presented to the American Gear Manufacturers' Association at its annual meeting in 1935. Both of these investigations were made on spiral-bevel rear-axle gears, in-

dicating that the rear-axle drive presents the most difficult gear problem. Mr. McMullan's paper was abstracted in AUTOMOTIVE INDUSTRIES of Oct. 5, 1935, while Mr. Almen's paper was printed in full in AUTOMOTIVE INDUSTRIES of Nov. 16, and 23, 1935.

From the results of these investigations it appears that automotive gears generally fail by fatigue. At certain points of the tooth surface concentrations of stress occur, either because of the design of the teeth or because of imperfections in machining, or distortion during heat treatment. At moments when extreme loads are being transmitted the stresses at these points exceed the yield point, and a crack or fissure starts, which increases in depth every time the load transmitted reaches this same excessive value, until finally the tooth breaks. This is the *modus operandi* of tooth

## R STEELS —



breakage. There is also another form of gear failure, consisting in destruction of the teeth by scoring. In a recent article in these columns attention was called to the fact that with gears in heavy-duty service, as a pair of teeth come in contact, the temperature at the contact surface reaches a certain flash value which is far above the temperature of the oil in the case. Under extreme conditions this temperature at the contact surface may become sufficiently high to cause some of the metal of one tooth to be welded to the other. This immediately results in unevenness of the tooth surfaces, and as the metal in the vicinity of the point where it reaches welding heat also is very hot, and therefore relatively soft, scoring starts. Thus scoring as well as tooth breakage starts at a point of stress concentration. In the former case the stress is compressive, in the latter tensile. In each case, however, the stress concentration is likely to be due to warping or distortion of the teeth during heat treatment, after completion of the cutting operation. This brings out the fact that one of the most important qualities of any automotive gear material is relative immunity from distortion due to quenching.

Less importance is attached at present to the tensile properties of gear material than was the case in the days when the load-carrying capacity of gears was generally calculated by the Lewis formula. It would be an exaggeration, however, to say that the mechanical properties, such as the tensile strength and elastic limit, are of no consequence, because, after all, a fatigue failure can start only if the elastic limit is exceeded, and this is less likely to occur if the elastic limit of the material is higher. But it appears that for gear steels some other properties are more important, chief among these being the relative freedom from warping or distortion during the quench.

In the selection of gear steels, therefore, four items must be considered, namely, the tensile properties, the relative immunity from heat distortion, the machining qualities, and the cost of the steel. The last two items mentioned affect the cost of the final product. A further cost item is that of heat treatment, and it may, therefore, be said that, other things being equal, that steel is best which requires the simplest heat treatment.

#### Nickel in Case-Hardening Steels

Of the various steels used for automotive gears today, nickel and chrome-nickel steel have been used longest. The two nickel steels principally used are Nos. 2315 and 2512, or slight modifications thereof. General Motors Corporation indicates its modification of the S.A.E. steels, which consists in limiting the carbon range to 5 instead of to 10 points, by adding a capital A to the number. Both of the steels mentioned are low-carbon, case-hardening steels, the first being the so-called 3½ per cent nickel, the other, 5 per cent nickel steel. The latter, of course, has the better mechanical qualities, but it also costs more, and its use, therefore, is largely confined to products intended for severe duty and which carry a relatively high price. The effects of nickel in case-hardening steels have been summarized as follows by the International Nickel Co.:

1. Nickel provides appreciable improvement in the properties of both case and core. These advantages include greater strength and toughness, higher resistance to fatigue and wear.

2. When present in sufficient proportions, alone or in combination with chromium and/or molybdenum, nickel permits hardening of the steel to be carried out by oil quenching. This gives more uniform results,

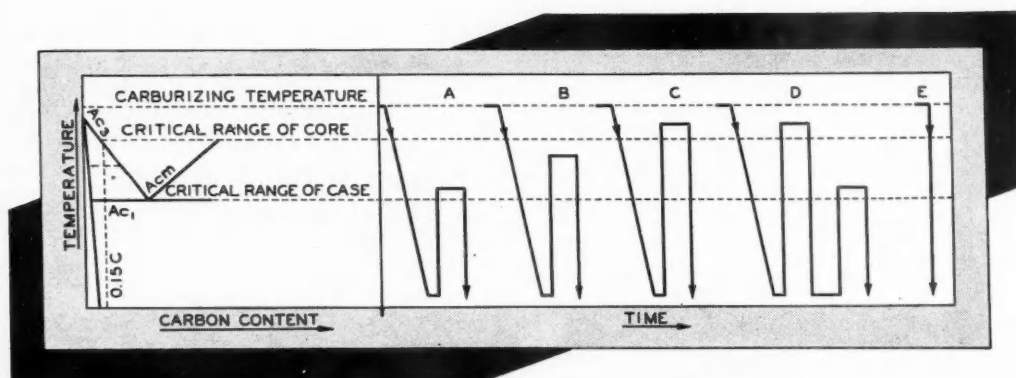
minimizes the danger of cracking, helps to reduce distortion and facilitates the treatment of parts of complex form.

3. Nickel promotes depth hardening in steels. Especially when present in combination with chromium and/or molybdenum, it makes possible the satisfactory treatment of parts of appreciable diameter or thickness.

4. Nickel lowers the critical temperature ranges of the steel and makes possible the use of low quenching temperatures with a decrease in the scaling.

5. Nickel reduces the temperature difference between the critical ranges of case and core. This, together with its tendency to obstruct grain growth, makes nickel steels well suited to single quenching treatments after carburization. The case hardening process is simplified and distortion minimized.

The 2315 steel (or the 2320, which is similar to the former but has a slightly higher carbon content) shows considerable resistance to grain growth, and if carburizing is effected at a relatively low temperature the second quench often necessary to refine the grain of the core may be omitted. A relatively high surface hardness is obtainable by quenching in oil and as, owing to the effect of the nickel on the critical points, a low quenching temperature can be used, distortion is minimized and scaling is also reduced. Machining qualities are generally good. Of course, the machining qualities of this and other steels depend to a considerable extent upon the forging technique, as was shown by an investigation made at General Motors Corporation's Muncie products plant in 1932. It was there found that if forging was carried on at too low a temperature, the forging would be porous and would be very hard to machine.



Different heat treatments following carburization.

To minimize distortion in 2315 steel it is recommended that the steel be normalized before carburizing at a temperature about 50 deg. higher than the carburizing temperature. The 2512 steel, owing to its higher alloy content, shows higher core strength and especially greater toughness. The higher nickel content also further depresses the critical points and makes possible a lower quenching temperature, with its favorable effect in minimizing distortion. This steel is used particularly for the rear-axle ring gears of buses and heavy-duty trucks. The surface hardness obtainable with this steel is not quite up to that obtained with some of the other gear steels, owing to the fact that the steel has air-hardening tendencies, and austenite is retained at points of maximum carbon concentration in the case after heat treatment. It is believed that in service the austenite in the case becomes transformed under the effects of pressure in a relatively short time. However, by using a steel of fine grain size, limiting the carbon content of the case by using less carburizing compound in the pots, and by using the lowest possible quenching temperature for hardening the case, the retention of austenite in the case can be prevented, as a rule. The mechanical properties of the core after heat treatment vary with the quenching temperature, with the quenching medium used, and with the grain size of the steel. Any increase in carbon content also increases the tensile strength and yield point, but usually an increase in tensile strength is accompanied by a reduction in the elongation and reduction of area.

Carburization of these steels is generally effected at 1650-1700 deg. Fahr. The gears are quenched either directly from the carburizing boxes or are allowed to cool in the carburizing boxes and are reheated for quenching. Heat treatments applicable to low-carbon gear steels containing nickel (that is, straight nickel, nickel-chromium, and nickel molybdenum steels) may be classified as shown in Fig. 1. The left-hand portion of Fig. 1 is the usual iron-carbon equilibrium diagram showing the variation of the critical temperature with the carbon content. It must be remembered, however, that the critical temperatures depend not only on the carbon content but also on the alloy content. As already mentioned, an increase in the nickel content lowers the critical temperatures.

The diagrams on the right-hand

side of the illustration are practical self-explanatory. All treatments start with the steel at the carburizing temperature, which is usually from 200 to 300 deg. above the

critical temperature of the core material. In most of the treatments the gears are allowed to cool slowly in the carburizing boxes, which is indicated by a sloping line. They are

Table I—Approximate Core Properties of Case-Hardened Alloy Steels

S.A.E. Steel No.	Approximate Crit. Range Deg. F. of		Treatment after Carburizing			Core Properties					
	Core	Case	Type (Fig. 1)	Heat, Deg. F.	Quench, in.	Yield Point, lb. per sq. in.	Tensile Strength, lb. per sq. in.	Elong. in 2 in. per cent	Red. Area, per cent	Brinell Hardness	Izod Impact ft. lb.
2315	1435	1305	A	1375	Oil	57,000	90,000	32	60	190	75
			A	1375	Water	60,000	95,000	28	55	200	60
			B	1425	Oil	95,000	115,000	21	51	225	55
			B	1425	Water	95,000	130,000	17	45	290	40
			C	1475	Oil	135,000	160,000	11	47	345	35
			C	1475	Water	150,000	180,000	9	45	390	30
			D	1525	Oil	60,000	95,000	35	65	195	85
			D	1375	Oil	65,000	100,000	30	60	210	70
			D	1525	Oil						
			D	1375	Water						
2515	1400	1285	A	1350	Oil	65,000	105,000	28	60	210	65
			A	1350	Water	70,000	115,000	26	55	230	50
			B	1400	Oil	110,000	140,000	18	55	260	45
			B	1400	Water	115,000	150,000	15	52	290	35
			C	1460	Oil	160,000	195,000	14	50	385	30
			C	1460	Water	165,000	200,000	13	50	390	30
			D	1500	Oil	70,000	110,000	30	65	220	75
			D	1350	Oil						
			D	1500	Oil	72,000	120,000	28	60	230	60
			D	1350	Water						
3115	1460	1355	A-B	1400	Water	85,000	130,000	16	45	260	35
			A-B	1400	Oil	80,000	120,000	18	48	250	45
			C	1475	Water	155,000	180,000	10	30	360	25
			C	1475	Oil	125,000	155,000	13	43	335	30
			D	1550	Oil	85,000	125,000	25	55	255	55
4615	1515	1340	B	1425	Oil	70,000	105,000	25	55	200	60
			B	1425	Water	80,000	115,000	22	50	220	40
			C	1525	Oil	195,000	145,000	17	52	300	35
			C	1525	Water	110,000	150,000	17	50	300	30
			D	1550	Oil	75,000	110,000	28	57	215	75
4815	1435	1305	D	1425	Oil	85,000	120,000	25	52	230	55
			D	1550	Oil						
"Krupp steel"	1430	1320	A-B	1400	Oil	165,000	195,000	12	40	390	35
			D	1525	Oil	170,000	200,000	13	42	400	40
			D	1400	Oil						



then reheated to a temperature which in treatment A is only slightly above the critical temperature of the case; in treatment B, slightly below the critical temperature of the core, and in treatment C, slightly above the critical temperature of the core. As refinement of the grain is dependent upon quenching from a temperature above the critical point, it is obvious that treatment A does not affect the core at all, while treatment B, in which the critical point of the core is nearly reached, refines the core only partly. It might be said that treatments A, B, and C are successive improvements so far as the core is concerned, while from the standpoint of the case the best structure is obtained with treatment A, treatment B giving a coarser, and treatment C a still coarser case structure.

The best results are obtained with a double treatment as represented by D. With this, after the gear has cooled from the carburizing temperature, it is reheated to above the critical point of the core and oil-quenched; then reheated to slightly above the critical point of the case, and oil-quenched. The first quench refines the core but coarsens the case, while the second quench, being from below the critical point of the core, does not affect the structure of the latter, but refines the case. Treatment E, a direct quench from the carburizing temperature, is applicable only to fine-grained steels such as 4615, as it does not refine the grain of either the core or the case. It hardens the core, keeps the excess carbide in the case dissolved, and retains the austenite in the case. With sufficient carbon the case will be file-hard. An advantage of this treatment as applied to such steels as low-carbon nickel-molybdenum (4615 or 4620) is that it keeps down heat-distortion to a minimum.

Core properties obtained with the different heat treatments from low-carbon case-hardening alloy steels containing nickel are given in Table I, the results having been obtained by J. W. Sands and E. W. Walls of the International Nickel Company. It will be seen from this table that for any particular grade of steel, as the heat treatment changes, the tensile strength, yield point, and hardness vary together, while the elongation, reduction of area, and the impact strength vary in the inverse sense as the former properties; in other words, whatever makes the steel stronger reduces its toughness.

The Krupp steel mentioned in the table is a case-hardening steel con-

taining 0.12 carbon, 4.10 nickel and 1.40 chromium, and ranks with the high-alloy S.A.E. steels 2512 and 4815. These steels are largely used for the transmissions and final-drive gears of heavy-duty trucks and buses. They are also much used for aircraft reduction gears.

In the foregoing, special emphasis has been laid on the plain nickel steels, and the question naturally arises as to how the chrome-nickel steels 3115 and 3120 compare with these. From Table I it can be seen that applying heat treatment D and quenching in oil from between 1550 and 1425 deg. Fahr., the tensile strength of 3115 steel is 75,000 lb. per sq. in.; quenching from between 1525 and 1375 deg. Fahr., the tensile strength of 2315 steel is 95,000 lb. per sq. in., and quenching from between 1525 and 1400 deg. Fahr., the tensile strength of 2515 steel is 115,000 lb. per sq. in. Thus the tensile properties increase with the alloy content, which is 1.85 per cent in the case of the 3115 steel, 3.50 in the case of 2315 steel, and 5.00 in that of 2515 steel.

Two grades of case-hardening molybdenum steel are being used for automotive gears, the 4615 (or 4620) and the 4815, the former containing 1.50 to 2.00 per cent nickel, the latter 3.25 to 3.75 per cent, while the molybdenum content of both ranges

between 0.20 and 0.30 per cent. The low-alloy molybdenum steel is one of the most popular steels for automotive gears, because it shows high fatigue resistance, and if of the fine-grained type, its heat-distortion is low. A tough core is obtained with only a single oil-quench, of almost the same strength as that of the more highly alloyed 2315 steel. Its chief advantage is probably its excellent machining quality. The various mechanical qualities obtainable in this steel by the application of different heat treatments are given in Table I, which permits of a direct comparison with the other case-hardening steels there listed.

The high-nickel 4815 steel is a comparatively recent development and possesses the advantage that it gives a very hard, wear-resistant case. Its core properties are similar to those of 2512 steel, and it is about equally well adapted to the single oil-quench as the latter. It is superior to 2512 as regards machining qualities. Heat distortion of this steel is low even in complicated forms.

It has been shown by O. W. McMullan of the International Nickel Co. that 4615 differs from all other gear steels in that when hardened by direct quenching from the carburizing box, the load-carrying capacity does not decrease with increase in case depth. It may be

Table II—Chemical Composition of A. G. M. A. Alloy Gear Steels

No. <sup>1</sup>	Carbon	Manganese	Phos. Max.	Sulph. Max.	Nickel	Chrome	Vanadium		Molybdenum
							Min.	Desired	
2315	0.10-0.20	0.30-0.60	0.04	0.05	3.25-3.75	.....	.....	.....	.....
2350	0.45-0.55	0.50-0.80	0.04	0.05	3.25-3.75	.....	.....	.....	.....
2512	0.17 max.	0.30-0.60	0.04	0.05	4.75-5.25	.....	.....	.....	.....
3115	0.10-0.20	0.30-0.60	0.04	0.05	1.00-1.50	0.45-0.75	.....	.....	.....
3215	0.10-0.20	0.30-0.60	0.04	0.045	1.50-2.00	0.90-1.25	.....	.....	.....
3250	0.45-0.55	0.30-0.60	0.04	0.045	1.50-2.00	0.90-1.25	.....	.....	.....
3312	0.17 max.	0.30-0.60	0.04	0.045	3.25-3.75	1.25-1.75	.....	.....	.....
3340	0.35-0.45	0.30-0.60	0.04	0.045	3.25-3.75	1.25-1.75	.....	.....	.....
6120	0.15-0.25	0.30-0.60	0.04	0.045	.....	0.80-1.10	0.15	0.18	.....
6150	0.45-0.55	0.50-0.80	0.04	0.045	.....	0.80-1.10	0.15	0.18	.....
4615	0.10-0.20	0.30-0.60	0.04	0.05	1.50-2.00	.....	.....	.....	0.20-0.30

<sup>1</sup> S.A.E. Steel Numbers.

pointed out in this connection that the other steels showed this tendency only when quenched directly from the carburizing box; when they were allowed to cool before being heated for quenching, this tendency was reversed in the low-alloy steels, and reduced in the case of high-alloy steels. All double-quenched steels increased in strength with case depth. McMullan's tests were carried out on rear-axle gears which were made to transmit a torque 60 per cent greater than the maximum they were designed for, and the number of pinion revolutions before failure was read from a counter and taken as a measure of the endurance life of the gears. His conclusion regarding the low-alloy molybdenum steel 4615 was that when "pot-quenched" it apparently has sufficient austenite in the case to maintain file hardness even at high temperatures. For this reason it is much better for spiral-bevel pinions than some stronger alloys, such as the Krupp steel. According to McMullan, an excellent combination for rear-axle gears, ensuring a long service life, is obtained by using 4615 for the pinion and the Krupp grade for the gear, because the former material does not soften perceptibly at operating temperatures, while the latter has the greater strength called for in the gear teeth. That the pinion material must be able to better withstand high operating temperatures is due to the fact that the pinion becomes much hotter, since each of its teeth comes into contact several times as often as each tooth of the ring gear.

Coming now to what are generally referred to as the direct-hardening gear steels, those used in the automotive industry include the nickel steel 2340, the molybdenum steel 4640, the chromium steel 5140 and the chrome-vanadium steel 6145. What makes these steels direct-hardening is the carbon content, which is expressed by the last two digits of the number of the steel, and will be seen to be practically the same for all (0.40 per cent in three cases and 0.45 per cent in one).

The chief advantage of the direct-hardening over the case-hardening gear steels is that the former provide greater core strength. The surface hardness obtained with these steels is less than that of case-hardened steels, and varies with the carbon content—the higher the carbon the greater the hardness. There is no great difference as regards tensile properties between the various direct-hardening gear steels, but the

toughness generally increases with the alloy content.

The molybdenum steels containing nickel are generally regarded as equivalent to nickel steels with the next higher nickel content. Thus the low-carbon molybdenum steel 4620, which has an average nickel content of about 1.80 per cent, is regarded as the equivalent of a 3½ per cent nickel steel, and the 4820, which has an average nickel content of 3.50 per cent, is regarded as equivalent to the 5 per cent nickel steel 2512. In tensile properties the molybdenum steels are *not quite* equal to the higher nickel steels, but they have better machining qualities, anneal more readily, and form a harder case. The tendency to develop an austenitic case seems to increase with the alloy content and is therefore less pronounced in the molybdenum steels than in the nickel steels with higher nickel content.

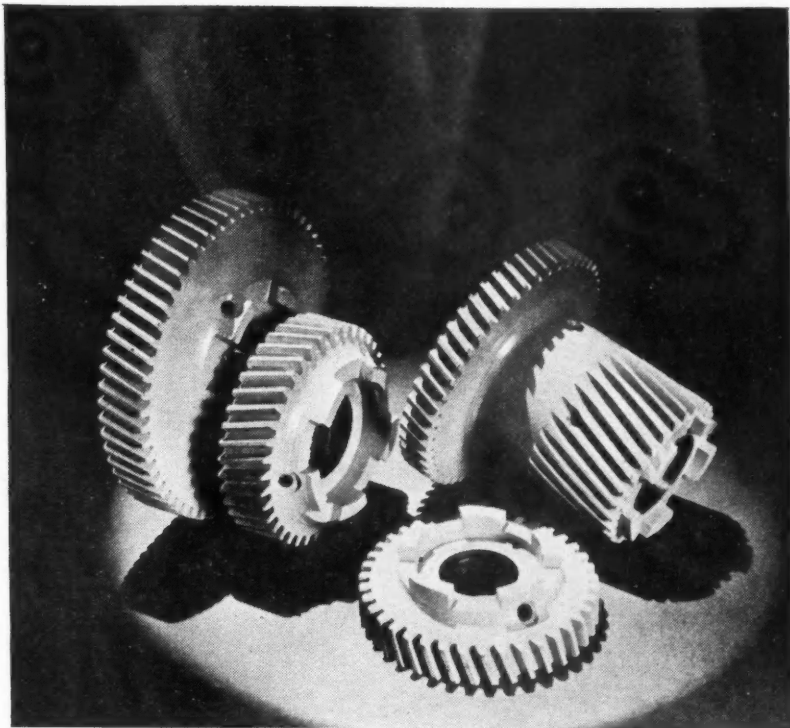
In hardening the higher-carbon steels, much use is made of the cyanide process. The gears are submerged in a bath of molten cyanide of sodium, or cyanide of potassium, which is maintained at a temperature somewhat above that from which quenching is to take place. The cyanides are dissociated by the heat, liberating nitrogen which combines with the surface metal to form nitrides. After quenching, these nitrides are very hard. In addition

to giving increased surface hardness, heating the gears in a cyanide bath before quenching has the advantage that it prevents oxidation and scaling of the metallic surfaces, which makes the quench more effective and also facilitates operations performed to correct distortion.

In recent years the direct-hardening molybdenum steel 4640 has come into use for the gears of automobile transmissions. A slight modification of the S.A.E. 4640 specification (with a carbon range of 0.35 to 0.40 instead of 0.35—0.45) is being used by Warner Gear Company, and the properties of this steel were discussed in an article in *AUTOMOTIVE INDUSTRIES* (issue of July 18, 1936, page 90) by E. F. Davis, metallurgist of the company.

According to Mr. Davis, the chief advantage of this steel is its high fatigue resistance, due to its ability to develop high tensile values by heat treatment without a corresponding loss of ductility. In dynamometer runs at torques 30 per cent greater than the maximum of the engine for which the transmission is intended, the gears show from three to four times the life obtained from chromium steels of the same carbon content. This has permitted of increasing the torque ratings about 10 per cent. Tests on six specimens showed an average yield point of 183,000 lb.

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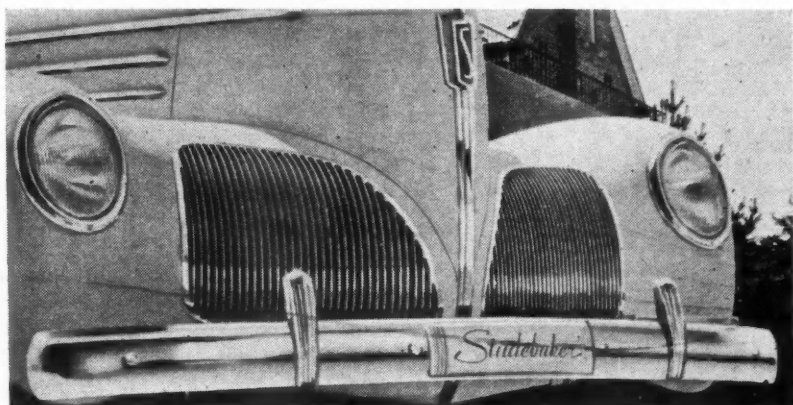




## '39 Cars

At the top is shown the apron used between the radiator and hood on Diamond T trucks. On the black background are the four parts of the Pontiac grille. To the right of it are several parts used in heaters produced by the Eaton Mfg. Co., while below the Pontiac grille is shown the grille of the apron seen on the Diamond T truck above. The lower right picture shows adapter parts used for heating and ventilating system of Hudson cars. All of these have been die cast in zinc alloys.





Studebaker's fender grilles, hood moldings, nose ornament and headlamp bezels are zinc alloy die castings

# Use More Die Castings

By HERBERT CHASE

**A**UTOMOTIVE engineers are making new uses of zinc alloy die castings in many new products for 1939.

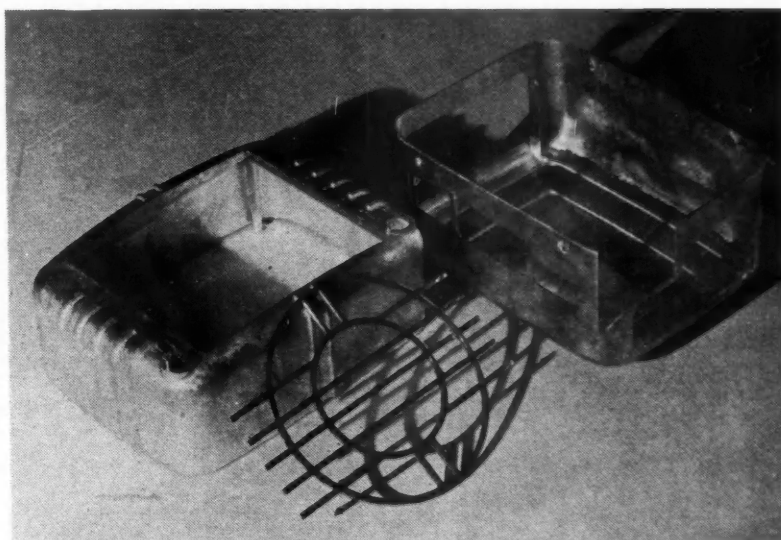
Instrument panel parts constitute one of the important uses of die castings. They include glove doors, radio grilles, instrument frames or bezels, and other parts both decorative and structural. In several instances, these die castings have taken the place of stamped equivalents, usually with some saving in cost and with a material improvement in appearance. In Cadillac, LaSalle and Olds, plastic moldings have been displaced. The first two had molded radio grilles last year with some small plated die cast parts inserted, making necessary both a die casting and plastic molds. The latter usually are more expensive than die casting dies. This year, the entire grille is die cast and plated and provides recesses for a die cast lock and for some small plastic parts, including a convex lens-like strip which is carried clear across the instrument panel.

Glove doors are among the parts produced in both stamped and die cast form, with costs probably favoring the stamped form where production is unusually large, and the die casting in other cases. Appearance usually favors the die cast type, especially when—as is usual—some portions are raised and plated, with recesses giving a grained finish.

The latter is readily applied to a die casting if the proper ground coat is provided but, if the graining be in a recess, it is not always easy to get a sharply defined line, especially in a transfer, at inside edges and corners. In the Buick glove door, which was stamped last year and is die cast in 1939 models, this had led to the use of a stamped insert which is grained separately and is afterward set in the recess. The edges of

the stamping are turned inward and through the opening for the clock, these edges afterward being bent outward to fasten the stamping. This expedient is not adopted, however, in such die cast instrument panel parts and glove doors as are used on Dodge and Plymouth. In these the graining is applied direct to the recessed surface of the die castings.

Die cast glove doors can be made in one piece with integral hinges



Two heater housings and a heater grille produced by the E. A. Laboratories die cast in zinc alloy



At the top is shown the new Buick's louvre which also includes the latch handle. Directly below it is the rear window bezel used on some of the Cadillac models, and the headlamp bezels used on DeSoto, Plymouth and Overland cars. The two lower views show the Buick instrument panel with the radio grille and glove door which are zinc alloy die castings as are also the other parts mentioned before. The inset view is the rear side of the glove door.

and recesses for lock and clock and do not have any tinny sound. Stamped doors require inner and outer walls, stamped separately and assembled, and some supplementary parts and the stampings lack the sharp lines usually desired and attained in the die casting. Most radios have provision for button tuning, and button recesses are sometimes provided in the radio grille casting and sometimes in separate castings.

Another part in which the die casting is used is the headlamp bezel or door, for a large proportion of the headlamps which are recessed into fenders or fender aprons. All Chrysler makes as well as Studebaker, Hudson, Overland, Nash and Graham cars are using die cast bezels this year, some of them for the first time. An engineer of a prominent automobile company makes the following statement regarding his choice: "The headlamp door was designed as a die casting due to appearance, ability to control shape, prevent possibility of red rust, and ease of assembly made possible by tapping bosses cast on the back of the door." All cars in the Ford lines except the large Lincolns have recessed headlamps with stamped bezels, but these are the only makes in large production in this category not yet converted to the die cast form. A great many tail lamps and license lamps continue to be die cast and Buick's direction signal, a new departure as a built-in product, has a light die cast shell and includes a full dozen small castings, of which ten are individual letters spelling "Buick Eight." Each letter has an integral lug which passes through the trans-

parent red plastic lens and is fastened with a speed nut.

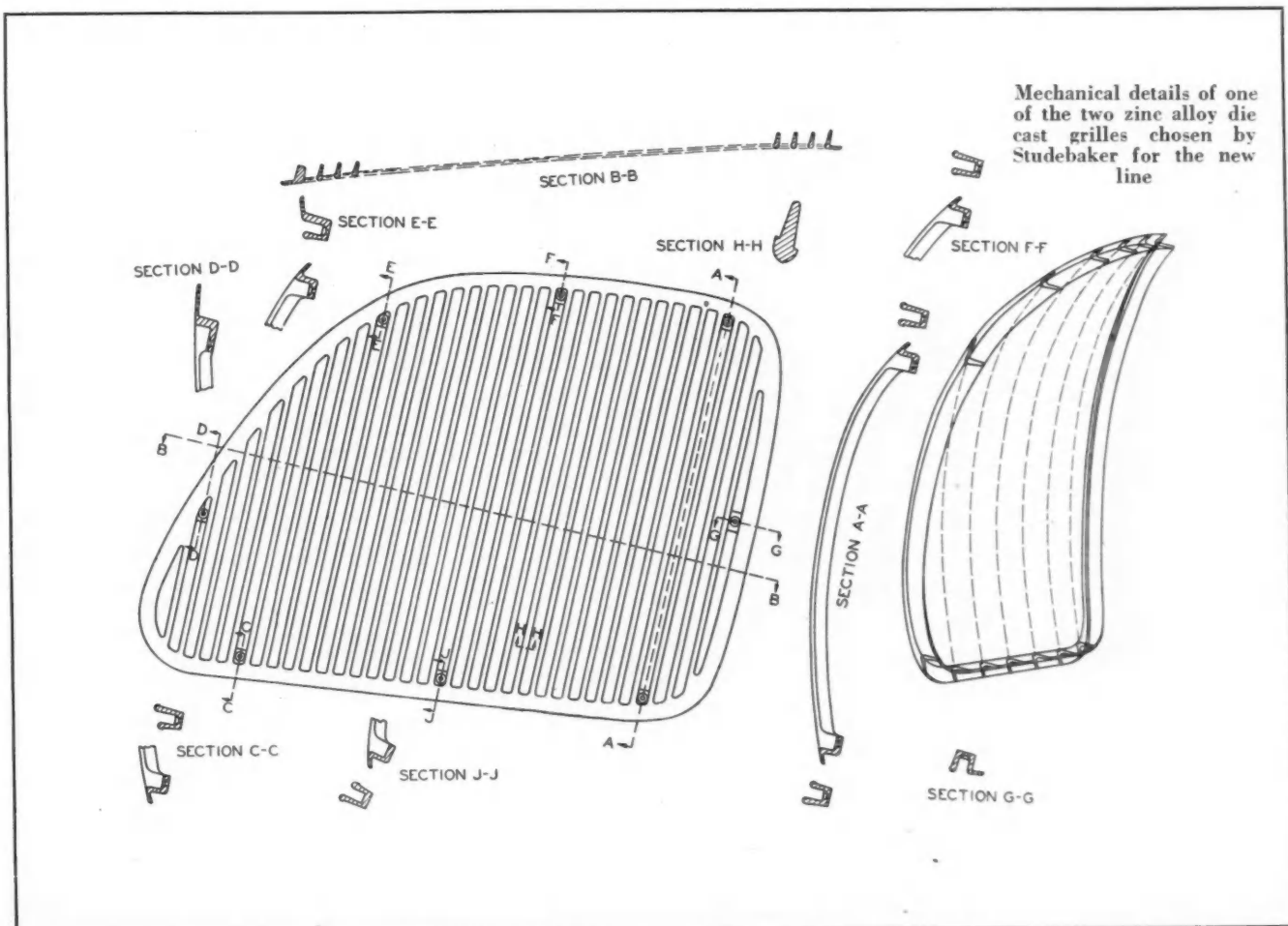
Nearly all cars in the Ford, General Motors and Chrysler lines as well as several others have new die castings on hood or other parts which spell the name and sometimes the model designation of the car. Such die castings give clean-cut letters which are attractive and easily fastened in place. Some such name plates are used inside as well as outside the body. A new form of collar of speed clip in spring steel is now being employed to fasten die castings with integral lugs which cannot be reached from the back. The clip is applied over the lug after which the die casting is pressed into place and is automatically locked by the clip, making for rapid and convenient assembly.

As radiator and fender grilles continue among the most prominent of die castings, some discussion of changes which have occurred in their design deserves prominent mention. There has, of course, been a sharp swing toward the fender grille following the example set by Lincoln Zephyr a year ago, but with

many variations. Die cast fender grilles are now used on nine of the ten makes of cars which employ the die cast grille in any form. Six makes have separate die cast "nose" or radiator grilles and five of them carry, in addition, die cast fender grilles. Nash has a die cast nose grille, and fender grilles of stamped or rolled section. Pontiac is using two pairs of die cast fender grilles for the first time, but continues the "silver streak" in sheet metal and has the nose pierced with horizontal groups of louvre-like openings in addition. All die cast grilles except Nash's are produced in two or more pieces with the average area per piece probably averaging in the neighborhood of one square foot, or rather smaller than heretofore. Average weight of complete grilles is also believed to be lower than ever before. On the Chrysler, the fender grille which extends straight across below the nose has 19 vertical bars, each cast separately, and in the nose are two additional castings each with four horizontal bars. DeSoto and Dodge have dropped die cast in favor of stamped grilles, but with

Studebaker and Pontiac using die cast grilles for the first time and Hudson and Nash returning to the die cast form, there is a net gain in the number using the die cast type.

One maker using a pair of fender grilles reports that these were designed both for die casting and for stamping and that the die casting was selected for the following significant reasons: (1) tool cost was about 50 per cent lower and unit cost was virtually the same (2) appearance of the die casting was better, partly because the bars could be formed in a streamline section and also because it was possible to secure well rounded edges at top and bottom of openings and to provide a finish flush with the fenders (3) shape is always constant, which could not be assured in the stamping because of variable spring back (4) the die casting comes in one piece, hence there is no assembly cost in the grille itself. These advantages cited by the engineer concerned are important, of course, and account for the increasing popularity of the die cast grille in gen-







At the top is Hudson's front end with the new grille. Below that are some parts of the E. A. Laboratory heater and the new Buick direction signal. The two lower views show the Cadillac instrument panel. The central portion of this, including the radio grille recesses for lock and control parts, are die cast in zinc alloy as are all of the other parts mentioned.

eral. Although it has been possible, especially where quantities are unusually large and the grille is designed especially for stamping, to produce it at a cost somewhat below that of the die cast equivalent, most of the advantages cited for the die cast form are sacrificed in so doing.

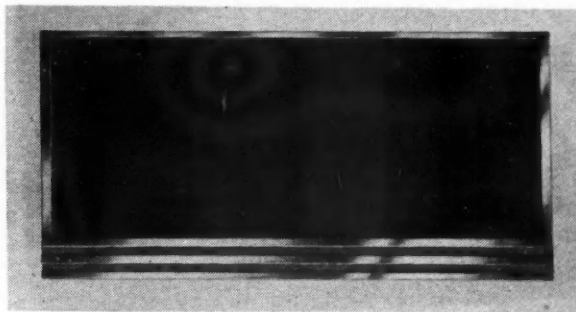
As to hood louvres, these are rather less prominent than in some years, and some cars have none. Consequently there are fewer made in die cast form than in some earlier years. Buick, however, has returned to the die cast louvre, and has at the same time introduced an innovation by combining the hood latch handle with the louvre in a smart design. This change is understood to have been dictated chiefly for reasons of styling, but the piece cost is said to be approximately one-half that of the former stamped louvre assembly and the die cost only one-fourth that of the stamped assembly. The latter did not include any latch parts and sometimes showed pitting within a few months. Appearance of the die casting is superior to that of the stamped assembly.

There are several new die cast moldings for hoods and bodies which doubtless would have been produced in sheet metal had it been possible to secure equal or better results as to cost, appearance, and ease of fastening. A case in point is the Studebaker hood moldings which run up to 57½ in. in length, and vary in width from 5/16 to 1½ in., and in some instances are curved. Such moldings are not easy to produce in stamped form and involve high die cost unless the section is such that it can be rolled.

There is also the problem of fastenings, which usually have to be separate pieces in a stamping but can be integral bosses with the die casting. The latter can also have abrupt changes in section height and thickness, if desired.

With one possible exception, on which data are not at hand, the die casting has completely displaced stampings for the commoner and more important exposed hardware parts, both interior and exterior. Plastic knobs continue in extensive use, but are displaced by die cast knobs with plastic trim on certain General Motors cars. Plastic trim parts are added, however, on the die cast interior handles, window regulator cranks and bezels in these cases. There is a more extensive use of die castings in door latches and striker plates. The Hancock type with rotary die cast star wheel, used last year by Studebaker for the first time, has been extended to

Plymouth glove door which is a zinc alloy die casting and has the recessed panel in a grained finish applied direct. The raised portions are plated and polished



three cars in the Chrysler lines.

There is an extended use of die cast horn rings, with some novelties in shape, and a continued use of die cast steering wheel hub parts, especially on deluxe flexible wheels. Such hubs with cover now weigh about 1½ lb., whereas they ranged up to six pounds in weight about

three years ago. Either this year or in some past year the die cast hub has, in general, taken the place of a sand casting (usually malleable iron) and is much smoother and lighter. Certain makers have reverted this year to sand cast hubs, for reasons on which data are lacking, in making conversions to under-wheel shifting. Several new die cast parts are used in the new shifting equipment, however, including brackets for the shifter tube and, on Chevrolet, for the head in the vacuum cylinder.

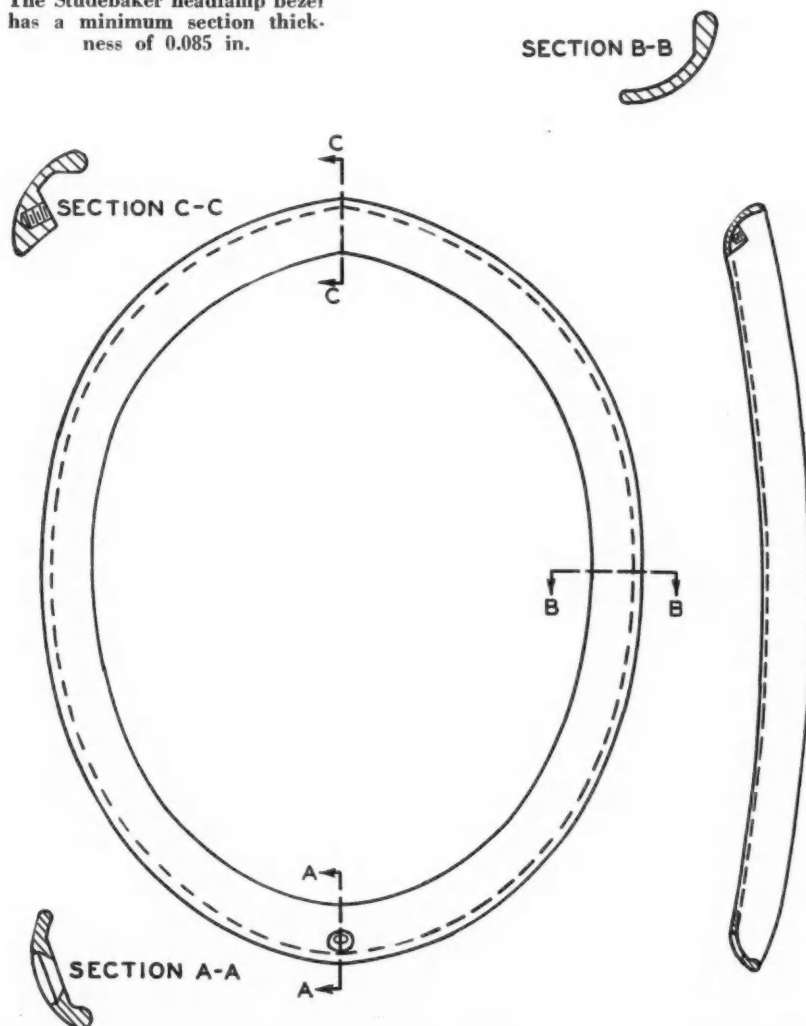
Hudson uses under the cowl a pan for collecting air which is delivered to the heater or, alternatively, through a trap door directly into the car. This die cast assembly has over-all measurements of 5 x 8 x 18 in., averages about 0.050 in. thick and weighs only 4 lb. One of the Eaton heaters has a shroud about 8 x 9¼ in., with a central hole about 7 in. in diameter having an inwardly turned flange (over-all height 1½ in.). This casting weighs only 8½ oz., for it has a section thickness of about 0.035 in.

One interesting new and quite large zinc alloy die casting is used as a decorative apron beside the radiator on Diamond-T trucks. It appears somewhat like a grille but has no openings between the bars, which are of channel section. The casting weighs 3 lb. 9 oz. and measures 7 x 23 in. over all. Section thickness approximates 0.080 in. at thin points.

### Multiple Disk Magnetic Clutch

THE STEARNS MAGNETIC MFG. CO., MILWAUKEE, WIS.: An improved type of multiple disk magnetic clutch, style ED. The clutch is designed to operate two clutches, both magnetically energized with a single magnet. The unit can be operated in either direction simultaneously.

The Studebaker headlamp bezel has a minimum section thickness of 0.085 in.



# Gear Steels

(Continued from page 793)

per sq. in., an average tensile strength of 292,500 lb. per sq. in., an average elongation of 11 per cent, and an average reduction of area of 34 per cent.

While the impact value of 4640 is lower than that of 2340, the former steel when oil-quenched develops a higher cyanide-case hardness. According to Mr. Davis, 4640 ranks very high with respect to fatigue resistance, due to the fact that it possesses high strength and hardness without brittleness.

Another advantage claimed for 4640 as a gear steel is that it can be quenched at as low a temperature as 1420 deg., without much agitation of either the parts or the oil, which reduces the amount of distortion.

Distortion presents a particularly serious problem in connection with the gears of modern transmissions, which are practically all of the helical type, so that errors not only of the involute tooth face but also of the helix angle are introduced.

At Warner Gear, pinions and gears produced from 4640 open-hearth steel are given a single heat treatment. After being dried and slightly warmed, the gears are submerged in the cyanide bath and raised to the quenching temperature.

They are quenched in oil. The cyanide case is usually about 0.006 in. deep and is file-hard. The core hardness usually exceeds 500 Brinell, but this depends on the mass of material in the part and on the thickness of its sections.

Another direct-hardening steel that is used to a certain extent for transmission gears is the chrome-vanadium steel 6145. It contains between 0.80 and 1.10 per cent of chromium and between 0.15 and 0.18 per cent of vanadium. To make it machinable, the steel must be normalized at between 1600 and 1650 deg. Fahr. and cooled in still air. Gears made of this steel are hardened by heating in a bath of molten cyanide and quenching in oil from a temperature between 1550 and 1650 deg. Fahr., depending on the section. After the quench these gears are tempered, the same as other hardened gears. When they are tempered at 500 deg. Fahr., the Brinell hardness is above 500, while if tempered at 1150 deg., it is only about 300.

Carbon-vanadium steel is used for

gears that are surface-hardened by heating the surface progressively by means of an acetylene torch and quenching immediately by means of a jet of quenching liquid. This hardening process has been used extensively abroad. Prior to surface hardening the gear is usually normalized and tempered. Vanadium steel is claimed to show unusual resistance to grain growth when heated well above the transformation point. The flame-hardening process is applied to medium-carbon steel. A carbon vanadium steel with 0.49 C, 0.77 Mn, and 0.16 Va, showed a core hardness of about 15 Rockwell C, and a surface hardness of 61 Rockwell C. The decrease in hardness toward the core was very gradual.

A gear steel not unlike the chrome-vanadium steel 6145 is the chromium steel 5140, which has practically the same carbon, manganese and chromium ranges as the former, but

contains no vanadium. Where vanadium is used as an alloy, its chief effect seems to be to refine the texture or to reduce the grain size. A secondary effect is that carbides rich in vanadium are formed, which have unusual stability at high temperature. These effects of the vanadium are, of course, lost in the plain chromium steel.

In transmissions it is not unusual to use two different gear steels. The greatest tooth stresses usually occur in the low-speed and reverse pinions, although it is, of course, only a rather remote possibility that the reverse gear should transmit the full engine power. The low-gear pinion, therefore, and sometimes also the reverse pinion, is made of a high-alloy steel, whereas the remainder of the gears are made of a steel of lower alloy content.

Gear steels have been standardized by the American Gear Manufacturers' Association, the A.G.M.A. gear steels corresponding closely to S.A.E. steels. Specifications of A.G.M.A. alloy gear steels are given in Table II.

## Substitute for Metal Exhaust Pipes on Boats

A substitute for cast-iron, steel and copper exhaust pipes on motor boats is being offered by The Manhattan Rubber Mfg. division of Raybestos-Manhattan, Inc., Passaic, N. J. It is called Condor marine exhaust hose and is designed for wet exhaust on either Diesel or gasoline engines. The new product is claimed to combine flexibility and ease of installation with physical properties that have many advantages over metal pipe.

Metal exhaust pipes installed in power boats operating in salt water become pitted and corroded. In both salt and fresh water a weak sulfuric acid, formed when particles of unconsumed fuel mix with water, has a rapidly deteriorating effect on metal pipe. Metal exhaust pipe also transmits noise and vibration.

In addition to being immune from the effects of sulfuric acid and the destructive action of salt water, Condor hose is claimed to act as a dampener to both noise and vibration. The manufacturer states that the new type exhaust hose can be bent around obstructions; hence, cost of original installations and replacements can be reduced. And, since it does not readily transmit heat through its walls, it minimizes the danger of discoloring and blistering adjoining partitions and bulkheads.

Condor marine exhaust hose is fab-

ricated from rubber and duck. The inner tube is of heat-resisting rubber, while the outer cover is rugged and oil-resisting. Between its plies of strong duck is embedded a spirally wound wire to prevent collapse and to withstand pressure.

## CHILTON ROUNDTABLE

(Continued from page 788)

*job right the first time and these mechanics must be backed up with modern equipment parts and supplies. Without such backing the best of merchandising will be wasted. The customer will come in the first time but there won't be any repeat business.*

FROM

**AUTOMOBILE TRADE JOURNAL**

*A preliminary estimate based on reports from 40 of the 48 states places total motor vehicle registrations at 29,534,000 as compared with 29,705,000 as of December 31, 1937. It is quite possible that last year's record will be exceeded by a slight margin when the final figures are compiled. During 1938 approximately 2,000,000 less new cars and trucks went into service than during 1937.*